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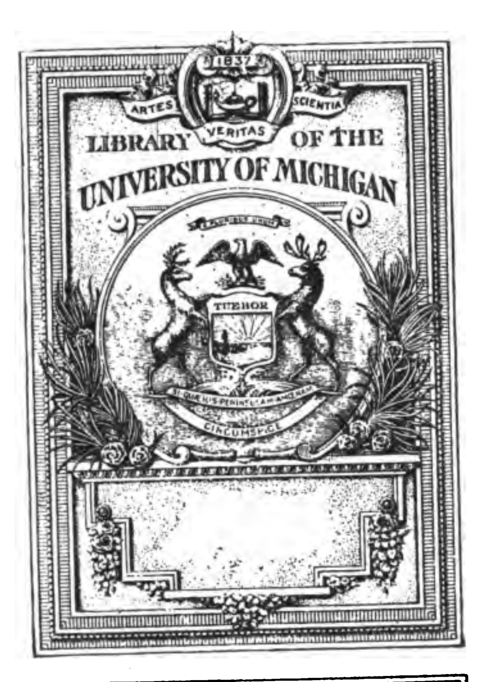
Department of Instruction, Teacher Training
and Research

COURSE IN

NATURE STUDY



Published by the Authority of the
Board of Education
City of Detroit
1922


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FOREWORD

STUDY NATURE FIRST; THEN BOOKS ABOUT HER

The strong conviction in the minds of educators that nature study should be taught in some form in all grades until pupils are ready for more formal science courses, has kept it in the curricula of many schools. "In one hundred and fifty cities in seven central states, two-thirds have nature study in elementary grades."

In very few places, have the possibilities of the subject been realized. There are many reasons for failures in this field, but the lessons learned from such failures, together with a few successes, are serving as building stones for the future development of the subject.

This tentative outline of a course of study for the first and second grades is intended primarily for the schools of Detroit. It is to be used experimentally until we shall be able, through eliminations and additions, to make a better course. Teachers of nature study are invited to test the outline and to co-operate in the fullest measure for its improvement and completion. You are invited to submit reports of experiments and methods of developing satisfactory results in subject matter and methods of teaching. Reports of methods which provide for purposeful activity on the part of the children will be of valuable assistance.

More topics are included for each month than can be covered satisfactorily as projects. Each teacher can select topics that are best adapted to her special grade problems.

The letters X. Y. and Z. after each title suggest the differentiation of the course to suit the X. Y. Z. sections. This is also subject to change.

Success or failure in nature study work probably depends more largely upon the method of teaching employed than upon any other single factor. If knowledge is made the aim and drill the method, disaster inevitably follows. Success can be achieved only by the teacher who realizes that in making of the human race, Mother Nature saw to it that everything in her domain should make an instinctive appeal at least to children.

Nature study is one subject in which the teacher's work can be clearly outlined. Her duties are threefold:

1. To present material which will awaken the children's interest

and stimulate them to some form of investigational or observational activity.

2. To assist them to plan such activities, and to carry them through to successful completion under their own direction.

3. To bring to them progressively, newer and wider interpretations of the results of such experiences.

In other words, the successful nature study teacher is the one who stays in the background as much as possible, preparing the stage, it is true, but letting Nature and Experience do the real teaching. Direct the children's attention to some unnoticed phase of their environment; then help the children find out what they want to know and do what they would like to do. Don't satisfy curiosity, but keep it alive and growing. Teach them the method by which they may satisfy their own curiosity. In so doing they will develop still other curiosities and purpose still further investigations. Dewey speaks of the "Process of Knowing." Make nature study a "Process of Knowing," not an act of learning.

The test of success in nature study teaching is not knowledge but interest and curiosity. If, as an outcome of the nature study work, children become actively and permanently interested in nature so that they, of themselves and out of school hours, exhibit an inquiring mind and find pleasure and joy in the natural phenomena which hedge us about on every side, the purpose of this special type of work will have been achieved.

TENTATIVE COURSE IN NATURE STUDY FOR GRADES I AND II

Purposes

1. To develop the pupil's consciousness of his surroundings and his power to analyze natural objects and phenomena in terms of pleasure and profit, both vital and economic.

The more he discovers that nature affords him his pleasures and the things essential to his life such as air, food, clothing, and shelter, the greater will be his activity in the conservation of all natural beauty and resources.

2. To eliminate the impulses of unnecessary fear and of the desire to kill.

3. To increase enjoyment in the out-of-doors and appreciation of references to nature in literature and art.

First Grade—A and B Classes

AIM: To aid the child to become acquainted with his environment and answer for himself some of his many "What is it?" questions.

September

Motive: Summer lingers while autumn approaches.

TOPIC 1—FLOWERS. X. Y. Z.

Nasturtium, morning glory, sunflower, and others easily obtained.

Activities

1. Have the children bring flowers for study and room decoration.

2. Give all children an opportunity to examine the flowers.

3. Appoint one child for each kind of flower to sort flowers into separate groups. Individuals may be selected to reassemble pleasing bouquets which all may judge after deciding on the basis of judgment. Put the bouquets in suitable places for decoration.

4. Take the flower selected by a majority of the children for special study such as the nasturtium flower and leaf. In helping the children to determine by what features they can recognize it in the future, draw attention to the color, size and shape of the leaf, the height of the plant, the place where seeds develop, and the significance of the horn or spur. Suggest that they watch for insects visiting the flowers.

5. Make paper cuttings or colored drawings of the flower and leaf. (The art teacher may correlate with the nature study work.)

6. Let the children learn the names of the other flowers by means of flower games. Find distinctive features in each. Test for odor and touch distinctions.

7. Let a committee be appointed to preserve one or two flowers of each kind by pressing them in an old magazine or between newspapers under weights. The pressed flowers may serve later for a memory test. Continue to bring in at intervals flowers for decoration, study, and review.

Literature for Children:

Lovejoy, Poetry of the Seasons.
Poetry of Autumn, p. 193.
Elson Second Reader—"The Girl Who Changed to a Sunflower."
In the Green Field, Sun Gold, p. 60.
Stories of Luther Burbank, The Rainbow Class, p. 80.

Teacher's References:

Trafton, The Teaching of Science, pp. 101, 119, 205.
Downing, A Source Book of Biological Nature Study, Chapter II.
Mathews, Field Book of American Wild Flowers.
Mrs. Dana, How to Know the Wild Flowers.
George, The Primary Plan Book, pp. 87-92.
Willis and Farmer, Month by Month, Autumn, pp. 13-27.
Beal, Flower Love and Legend.

TOPIC 2—INSECTS VISITING FLOWERS, BEES AND BUTTERFLIES. X. Y. Z.

Activities

1. Take the classes to a garden or field to look for insects visiting flowers. Make note of questions and observations. Next day discuss them. Emphasize the value of insect visits in seed formation. Provide mounted specimens of the butterfly.

2. Cut out and color designs of the butterfly, using the specimens as models. Paste the designs on a chart or blackboard.

Literature for Children:

The Merrill Second Reader.
The Bee's Story.
The Song of the Bee.
For Children's Hour.
The Baby Queen.
How and Why Library (Compton).
What Makes the Hum of the Bee?
Reading Literature—Second Reader.
The Queen Bee.
Riverside Second Reader.
The Bee and the Flower.

Teacher's References:

Holland, The Butterfly Book.
Comstock, Handbook, pp. 438-457.
Morley, The Bee People.
Dickerson, Moths and Butterflies.

TOPIC 3—SEED COLLECTING FOR NEXT YEAR'S FLOWERS. X. Y. Z.

Activities

1. Group task. Let each child watch for opportunities to gather flower seeds and vials or wide mouth bottles (Jiffy Jell).

2. Assemble like kinds and fill the bottles. Label the bottles and mount them with elastic tape on cardboard. Leave some without labels for a recognition test.

Teacher's References:

Seed catalogs.

TOPIC 4—AUTUMN SIGNS, COLORS OF TREES AND SHRUBS. X. Y. Z.

Activities

Keep a record of autumn colors by collecting and pressing leaves as fast as they turn. (The teacher should record the date.)

Sort them according to colors and kinds.

Literature for Children:

Bailey for the Children's Hour, "The Anxious Leaf."
The Art—Literature Reader, Second Book, p. 66.

TOPIC 5—DESTRUCTIVE INSECTS. X. Y. Z.

Woolly bear, caterpillars on milk weed, parsley, and lilac; tussock moth on trees.

Activities

1. The teacher should either show a sample collecting box, e. g., a candy box with the fresh leaves of a plant on which a caterpillar is feeding; or should have the children bring candy boxes which they can carry during a class hour collecting trip. (Perforate the covers to admit air.)

2. Problem: To keep caterpillars feeding during their growing, molting, and pupating periods. Teacher and pupils should make a feeding cage. Construct a cylinder of wire screen eight or nine inches in diameter with pie-tins at the top and bottom. Put sand and a bottle of water in the bottom. Place the stems of the leaves in water. Renew leaves frequently. Make daily observations. The pupils in the manual training department may be interested to construct a more permanent feeding cage and cocoonery with a wooden frame and two or more compartments.

3. Appoint a committee to care for cages.

4. Application: Destroy all tussock moth eggs on trees to save trees.

Literature for Children:

Grasshopper Green's Garden, the Most Beautiful One In the Garden, p. 71.
The Outdoor Book—"A Garden Fairy," p. 30.
Jenkins—Interesting Neighbors, "A Caterpillar Regiment."

Teacher's References:

J. B. Smith, "Our Insect Friends and Enemies."
Downing, A Source Book, Chapter II.
Month by Month Books—Autumn, pp. 30-31.
U. S. Dept. Agriculture, Farmer's Bulletin No. 99.

TOPIC 6—FRUITS. X. Y. Z.

Pear, peach, grapes, bittersweet, barberry, rose, hawthorn.

Activities

1. Have a few small branches with the leaves and fruits. Have other with the fruits and leaves separated.
2. Have a leaf and fruit matching game.
3. Test each child on the kind of fruit and its leaf.
4. Study the form, color, type and use of each plant. (Which fruits is mother canning?)

Teacher's References:

Nursery catalogs.
Month by Month, pp. 33-35.

TOPIC 7—FRUITS OF POISONOUS PLANTS. X. Y. Z.

Poison-ivy and night shade berries.

Activities

Learn not to eat berries on wild plants.

Color of poison-ivy berries; white; night shade; black and red.

Learn—

"Leaflets three, quickly flee!
Berries white, dread the sight."

Teacher's References:

Downing, A Source Book, p. 247.

TOPIC 8—BIRDS, FLOCKING. X. Y. Z.

Robins, grackles, a canary.

Activities: Use museum specimens and pictures

1. Study two birds for recognition.
2. Direct attention to their flocking, ready for flight.
3. If possible have a child living near the school bring a canary to be observed by the children for a day or two.

Literature for Children:

Bailey, For the Children's Hour.
"Ugly Duckling."
"The Rich Goose."
"The Robin."
"The Oriole's Journey."

Teacher's References:

Miller, First Book of Birds.
Chapman, Travels of Birds.
Reed, Song Birds.
Chapman, What Is That Bird?

TOPIC 9—FOOD FROM OUR GARDEN. X. Y. Z.

Beet or carrot; lettuce or spinach; tomatoes or pepper.

Activities

Have whole plants, where possible; otherwise branches with fruits.

1. Let the children learn to recognize (1) the edible parts of plants such as the roots, leaves, and fruits; (2) where these parts grow; in or on the ground, or high on the plant; whether or not they grow from the flower.
2. Visit an open vegetable market in the neighborhood and utilize interest in state fair or school garden exhibits.
3. Make colored drawings.
4. Originate stories about vegetable people and their own food storage for the future. Man has helped them to produce more each year and has taken his pay in food for his own table.

Literature for Children:
The How and Why Library.
"Why Plants Are Like Squirrels."

Teacher's References:
Sargent, Plants and Their Uses.
Coulter, Elementary Botany, Part II.

TOPIC 10—STOCK THE TERRARIUM. X. Y. Z.

Activities

1. Bring moss and other moisture-loving plants, soil, and animals, such as snails, frogs, turtles, crayfish, etc.
2. Feed the animals flies, bits of fresh meat and crumbs.
3. Through informal observations, let the children study their characteristic habits.

Literature for Children:
Stepping Stones Second Reader.
The Turtle.

Teacher's References:
Downing Source Book, pp. 7-21.
Supplementary Nature Study Outline (1913).

TOPIC 11—WEATHER, SIGNS OF AUTUMN. X. Y.

Location of East and West by the Sun; Dew on the grass. September as the first Fall month. Weather chart.

Activities

1. Locate the position and length of shadows on a shadow stick

placed in the window. Keep a record each class hour during the days of one week nearest September 21.

2. Take the children to the nearest tree standing in the open. Mark the outline of the shade on morning class, noon, and late afternoon. (Children may surround the shade and play a shadow game.) Find the center of the noon shadow.

The teacher should draw shadows noted at different hours for later class discussion. Make board drawings.

3. Watch opportunities for observing dew on the grass.

4. Try leaving a glass over the grass in the shade after the dew has dried. Let the classes observe the result.

Literature for Children:

For the Children's Hour.
"Who Likes the Rain," p. 170, and others.
Approved Selection for Reading and Memorizing. Second Year.
R. L. Stevenson, "My Shadow," "The Sun's Travels."
Stedman, An American Anthology.
F. D. Sherman, The Shadows.

Teacher's References:

Trafton, The Teaching of Science, pp. 187-189.
Comstock, Hand Book.
Thompson, Water Wonders Every Child Should Know.

Review September Observations

October

Motive: Nature's color display and home-hunting.

TOPIC 1—COLORS OF TREES. X. Y. Z.

Activities

Maples, oaks, and other trees in the neighborhood.

1. It may be possible to collect leaves from the soft maples (silver and red) and hard (rock, black, and Norway) and while sorting them according to color, to gain a conception of the general features of the maple-leaf.

2. Collect, at the same time, as many kinds of maple fruits as are available in the fall. From the leaf and fruit—similarities and differences among the various kinds, pupils may grasp the idea that all maples have the double winged fruit and similar leaves.

3. Watch all trees and discover which become bare first.

4. Continue leaf collection and pressing. Play leaf-recognizing games. Blueprints can be made of leaves in kodak printing frames.

5. Develop the idea that fallen leaves make of themselves a great blanket for the earth and for animals living in the ground.

Literature for Children:

Pythian, Trees in Nature, Myth and Art.

Teacher's References:

Stone and Fickett, Trees in Prose and Poetry.
Keeler, Our Native Trees and How to Identify Them.
Otis, Michigan Trees.
Rogers, Trees Every Child Should Know.
Needham, Outdoor Studies, Chapter III.
Comstock, Hand Book, p. 233.

TOPIC 2—OAKS AND SQUIRRELS. X. Y.

Activities

1. Oaks—leaves, acorns, and branches.
2. Make use of museum stuffed squirrels and pictures of squirrels.
3. Construct on the sand table an oak forest.
4. Cut out paper squirrels and color them.
5. Recall squirrels' nests in trees at Belle Isle and their gathering of acorns for winter's food.
6. Sort oak leaves according to (1) color, and (2) outline. (Round lobes belong to white oak group and the pointed to the black group.)
7. Acorns differ in size and in the sort of cups in which they sit. (Pin oak-smallest acorn in very shallow cup; red-large, in shallow cup; and bur oak-large in a shaggy cup that nearly covers it.) Have many types of acorns and an acorn for each child if possible. Sort them into piles of like kinds. The acorn is a baby oak tree in a tiny home. It drops to the ground among leaves, and is carried to a new home by squirrels.
8. The children should have learned in their project the habits of the squirrel, such as the gnawing, climbing, and nesting habits. They should know also that some are tree-squirrels, and others ground-squirrels. (If all cannot visit the park or forest to gather data, at least a small group may be taken and report as a committee to the class.)

Literature for Children:

Stepping Stones, Second Reader—"The Squirrels."
For Children's Hour—"Little Girl Who Would Not Work."
Elson's Second Reader—"The Kind Old Oak."
In the Green Field—"How Bobby Squirrel Fed the Hens," p. 28.

Teacher's References:

Burroughs, Squirrels and Other Fur-bearers.
Topic 3, Other Homes in the Oak Trees.
Oak Galls.

Activities

1. Lantern-like balls on the oak are insect homes. Open a few

and find larva (grub), and compare it with the caterpillar studied. Find other insect homes.

Literature for Children:

Patch, Gateway to Service.
Jenkins, Interesting Neighbors—"The Magic House."

Teacher's References:

Comstock, Hand Book, p. 360.
Trafton, The Teaching of Science, p. 75.

TOPIC 4—SEEDS—JOURNEYS TO NEW HOMES. X. Y.

Burdock, Beggar's Ticks (Bur-marigold, Cocklebur, Milkweeds, Wild Cucumber, Witch Hazel, and others.

Activities

1. The class may be taken to a vacant lot filled with weeds. Purpose: to find how weeds move to new homes next year. Burdock questions: Is it easy to pick the burs from the plant? Why do they cling to the fingers? Do they cling to the clothes?

2. Gather them in quantities and carry back to the class room for next lesson. Gather also fruits of Bidens, known as Beggar's Ticks.

3. Let the children remove the fruits of Bidens from a single head and note that there are so many "seed babies" on the mother plant that she must send them long distances to find new homes. Run the finger in both ways on the fork of a fruit and tell why they cling to the clothing.

4. Collect other kinds of seed travelers and spend the next class hour in utilizing all materials gathered in such activities that will impress the lesson. Milkweed, wild cucumber, and witch hazel can be brought in while they are green to open in school.

If milkweed and cucumber can be brought in abundance, let the children develop means of utilizing them, such as milkweed silk collected for doll-bed pillows, and wild cucumbers used as vegetable sponges, etc.

Literature for Children:

Horace Mann's Second Reader—"The Thistle Seed."
Jenkins, Interesting Neighbors—"The Band of Seed Hunters," p. 160.

Teacher's References:

Beal, Michigan Weeds.
Beal, Seed Dispersal.
Georgia, Manual of Weeds.
Weeds, Clarence M.—Seed Travelers.

TOPIC 5—TOADS AND OTHER ANIMALS THAT MAKE HOMES IN THE GROUND. X. Y. Z.

Activities

1. Obtain from the grocer a wooden or heavy paper box. Fill with soil to a depth of four or five inches. Include a saucer of water. Everything but food is ready for toads to be brought by the children. The toads will soon show where they make their homes (toads do not cause warts).

Literature for Children:

Gordon, Third Reader.
"The Friend in the Garden."
"The Tree Frog."

Teacher's References:

Hegner, Zoology.
Hodge and Dawson, Civic Biology.

TOPIC 6—BULBS. X. Y. Z.

Crocus, daffodil, hyacinth.

Activities

If bulbs can be supplied, children may plant crocuses in the school lawn or under shrubbery, and daffodils and hyacinths in pots for forcing.

Teacher's References:

Downing, A Source Book, pp. 415-417.
Bulb Catalogs from Commercial Seed Homes.

TOPIC 7—APPLES, FALL AND WINTER. X. Y.

A several days' project.

Activities

1. If the city declares an apple week, plan this activity for the same week. Consider the many ways apples can be used in the home.

2. Each pupil can bring an apple towards an apple lunch. Before preparing the lunch, learn as much about apples as possible. In what ways are all apples alike? (Shape, blossom, stem ends, seed pockets in core.) How do they differ? (Summer, fall, and winter apples: in color, uses, and names such as Greenings, Baldwins, etc.)

3. Have pictures and drawings of apple trees to illustrate the shape. Carry apples to sick children.

4. Make colored drawings of an apple or of a group of several apples of different colors.

5. Save the seeds of apples that are opened for study. Children may wish to count them and dry them. The story of "Johnny Apple Seed" is appropriate.

Literature for Children:

Bailey, For the Story Teller—"Appleseed John."
Gordon's Second Reader—"Appleseed John."
Harrison, In Story Land—"Appleseed John."
Poulsson, For the Children's Hour.

Teacher's References:

Comstock, Handbook, p. 785.
Bailey, Cyclopedia of Horticulture.

TOPIC 8—A PUMPKIN FOR HALOWEEN DECORATION. Z.

Activities

1. Make a lantern for the room.

2. Save the seeds, dry and string them for decoration. Precaution: do not run the needle through the seed embryo but through the rim. When mother makes pies, she may save the seeds for stringing.

TOPIC 9—CORN. X. Y.

Activities

1. Use cornstalks with ears for decoration.

2. Project: Corn (1) as the horse sees it; (2) as used by man. Associate the horse (characteristics, food, and habits) with his farm work,—plowing, planting, cultivating, cutting, and hauling corn.

3. Corn husking and shelling may be done by some of the children. (Save husks and cobs for Christmas dolls.)

4. Use popcorn for Halloween refreshment. Study it before and after popping.

5. Discuss other uses of corn.

6. Utilization of corn stalks.

Literature for Children:

Nature in Verse—"Corn."
Extracts from Black Beauty.

Teacher's References:

Comstock, Handbook, pp. 658-666.
Month by Month, Autumn, p. 185.

TOPIC 10—WEATHER STUDY. X. Y.

October Frosts.

Activities

1. Keep record of frosts and note their effect on plants.
2. Relate dew and frost.

Literature for Children:

Beacon Second Reader—"Mother Frost."
Verse and Prose (Riverside Series).
A Dewdrop.
Gordon's Third Reader.

Teacher's References:

Comstock Handbook, p. 853.
Thompson, Water Wonders Every Child Should Know.

TOPIC 11—SKY STUDY. X.

Activities

1. Continue observations on the sun. Look at the sun through a smoked glass.

2. Watch for the full moon. Mark date on calendar and note time of next full moon.

Literature for Children:

Stepping Stones, Second Reader—"Lady Moon."
R. L. Stevenson—"The Moon."
Zoe Meyers, The Outdoor Book—"What the Moon Saw," p. 97.

Teacher's References:

Comstock, Handbook, p. 889.
McKready, Beginner's Star Book.
Official Handbook Boy Scouts of America.
Comstock, Handbook of Nature Study.

Review October Happenings

November

Motive: The last fall month. Preparation for winter completed.

TOPIC 1—GROUND HOG OR WOODCHUCK. X. Y.

Activities

1. Story of woodchuck—Museum specimen if possible. Pictures.

2. Compare it with the boblink, which has changed to winter plumage and gone South. (Use pictures and museum specimens of the bobolink.)

3. Have children draw from imagination pictures of the woodchuck's home, four to five feet underground. Where is his food stored?

4. Compare the woodchuck's with the squirrel's preparation for winter home and food.

Literature for Children:
Firelight Stories.
Dallas Love Sharp—Autumn.
Gordon's Third Reader—"The Woodchuck."

Teacher's References:
Comstock, Handbook, pp. 229-232.

TOPIC 2—BEARS AT BELLE ISLE. X. Y. Z.

Activities

How do the brown, the black, and the grizzly bears spend their winter? A group of children may be taken to Belle Isle by parents or by the teacher to bring back reports.

Literature for Children:
Elsom Reader, Book IV—"Mishook, the Siberian Cub," p. 167.
Why the Bear Sleeps All Winter.

Teacher's References:
Information from city officials in charge of zoo.
Hornaday, Natural History.
Children's Museum Pictures.

TOPIC 3—WINTER BIRDS. X. Y. Z.

Sparrows, bluejays, downy woodpecker, chicken and peasants.

Activities

1. Last birds to migrate? When was the robin last seen?

2. Birds about the home? How attract different kinds? (Tie suet to branches of trees, scatter crumbs, etc.)

3. Their winter homes and food?
4. Protection given the chickens during winter by:
    A. Nature—Their feathers. Make a collection of chicken feathers. Study them.
    B. Man—hen houses and special food. Test the children's interest in construction of paper models of a chicken yard and house.
5. Where do pheasants live at Belle Isle? Make companions of chickens and pheasants.

Literature for Children:

Mrs. O. T. Hiller, Anecdotes of Birds (Second Book).

Teacher's References:

Michigan Birds, Barrows.
Comstock, Handbook, pp. 27-29, 41-44.
Downing, A Source Book, pp. 217-224.
Chapman, Travels of Birds.

TOPIC 4—WINTER HOMES OF INSECTS, CECROPIA, PROMETHEA, ETC. X. Y. Z.

Activities

1. Instruct the children where to look for cocoons. Bring in a few. Moisten them frequently or place them in a wire cage outside of the window. (Room too dry.)

Teacher's References:

Comstock, Handbook, pp. 330-339.

TOPIC 5—HIBERNATION IN GENERAL

Activities

Learn where the earth worms, snakes, turtles, frogs, crayfish and others spend their winter.

Literature for Children:

The Frog's Goodbye and others.

Teacher's References:

Hodge, Nature Study and Life.

TOPIC 6—CHINESE LILY AND PAPER NARCISSUS BULBS FOR CHRISTMAS. X. Y. Z.

Activities

1. Gather gravel and pebbles before the ground is frozen. Use enough in each dish to hold bulbs erect. Keep the bulbs in the dark one

or two weeks. Add water to keep the base of the bulbs wet.

Teacher's References:

Trafton, The Teaching of Science, pp. 126-127.

TOPIC 7—WINTER TREES. X. Y.

Leafless elm, soft maple, and other trees.

Activities

1. A lesson from the school window, or during a walk.

Purposes:

A. To count the trees entirely bare and note their shape.

B. To count the trees still holding leaves (not including pines). (Some oaks hold their brown leaves all winter.)

2. Observe a few branches of the horse chestnut or other trees to note that mother nature has provided a brown blanket of bark for the stem and overcoats for the buds.

3. The pressed leaves collected in September and October may now be mounted, blue printed, and made into books for an exhibit.

Literature for Children:

Lovejoy, Nature in Verse, p. 213.

Teacher's References:

Downing, A Source Book of Biological Nature.
Study, pp. 315-344.
Blakeslee and Jarvis, Trees in Their Winter Condition.
E. R. Mosher, Forest Study in the Primary Grades.
(Michigan Pub. Domain Commission, Lansing.)
Pythian, Trees in Nature, Myth, and Art.

TOPIC 8—NUTS. X. Y. Z.

Activities

1. A nutting party: preparation, execution (real or imaginary), and utilizing products.

2. Nut recognition game. Note the variations in the walnut and hickory nut coverings. (Save nuts for a Thanksgiving project.)

TOPIC 9—THANKSGIVING ACTIVITIES

Activities

Possible Thanksgiving Projects:

Pilgrims' Thanksgiving.
Thanksgiving in Our Home.
The Rabbit's Thanksgiving.

Literature for Children:

Nature in Verse, First Thanksgiving.
Bailey, For the Story Teller, Mr. Rabbit's Thanksgiving.
The Outdoor Book, Mr. Rabbit's Big Dinner, p. 38.

TOPIC 10—WEATHER. X. Y.

The first snow and snow clouds.

Activities

1. Make note on the calendar of the first snowfall.

2. Call attention to snow clouds. Note the time of snow duration. (Save the details of snow study for December.)

Literature for Children:

Lovejoy, Poetry of the Seasons (Winter).

Teacher's References:

George, The Primary Plan Book, Month by Month.

TOPIC 11—STARS FOR THE MONTH. X.

The Great Dipper, the Little Dipper, Cassiopeia's Chair.

Activities

1. Star constellations. The teacher should draw a diagram of the constellations on the board and make perforated stencils for mimeographing.

2. Let the children take home copies to use in locating, with help of parents, the constellations in the sky.

Literature for Children:

Beginner's Book of Verse and Prose. (The Star.)
Lucy Larcomb, Starlight.
Bailey, Legend of the Dipper.
Rosetti, Stars.

Teacher's References:

Gall, Easy Guide to the Constellations.
Milton, Children's Book of Stars.

Review November Topics.

December

Motive: Winter and service.

TOPIC 1—THE SEASONS EXPRESSED IN THE COLOR WHEEL. X. Y. Z.

Activities

1. Let the children learn the names of the seasons on the four fingers of the left hand. The forefinger should represent winter; the middle, spring; the third, summer; and the little one, fall.

2. The following is a season design that may be used on a calendar mount for Christmas gift. Materials for practice—Paper four inches square, pencil, colored crayons. Place the tips of the fingers on the paper to make the corners of a square, draw a circle around the outside of all four fingers, then two lines crossing at the center and running between the fingers. Name each quarter of the circle from the finger resting on it. Let each child color the quadrants according to his ideas of the seasons. At a second lesson, let the class judge the colors. Appropriate colors are:—blue for winter, green for spring, yellow for summer, and red for autumn. The teacher may mimeograph circles on drawing paper which the children can complete and use for calendar or booklet covers.

Literature for Children:

Poulsson, Finger Play.
Poulsson, In the Child's World (Winter, pp. 98-130).
Fabre, The Story Book of Science, The Year and Its Seasons.
Robt. L. Stevenson, Winter Time.

Teacher's References:

F. Waldo, Elementary Meteorology, pp. 42.
Collins, The Book of Stars, pp. 72-75.
Stereographs, "The Seasons," Autumn and Winter, Children's Museum.

TOPIC 2—WINTER COLD AND SUNSHINE. X. Y.

Activities

1. Let the children make observations for three consecutive days and nights to answer the following questions:

a. Does the sun rise before or after breakfast?
b. How high is the sun when seen en route to school?
c. Where is it located relative to the school?
d. How long after school closes does the sun set?

e. Where does the sun set?

f. What colors do you find in the sky at sunrise? At sunset?

g. Is it warmer or colder during daytime?

h. Do long nights help to make cold weather?

i. How cold do you think our earth would be with no sunshine?

2. Let the children represent the length of December days and nights in drawings or paper cuttings. Cut strips of paper for the twenty-four hours in the day, and color the night portion black and the day yellow. Make colored drawings of sunrise and sunset.

Teacher's References:

Compton, How and Why Library, p. 320.

TOPIC 3—WEATHER IN DECEMBER. X.

Activities

1. Weather calendar may show.

a. Day of week.

b. Kind of day, sunshine, rain, fog, snow, hail.

c. Clouds.

Teacher's References:

Children's Museum Pictures.

TOPIC 4—SNOW STUDY. X. Y. Z.

Activities

1. December problems: Watch the snow as it falls.

a. How large are the largest flakes as they light on the coat? The smallest?

b. Do large and small flakes occur in the same storm?

c. Do flakes fall straight downward?

d. Try to discover as many different shapes of snowflakes as possible. Some people have discovered many hundred shapes.

e. Is there uniformity in number of points. (Needle-shaped crystals.)

f. What shape is snow that stings the face?

g. Which kind of snow makes the best balls?

2. Uses of snow:

a. Keeps man, animals, and plants warm. How? (Learn "Putting the World to Bed.")

b. Beauty. Make drawings to illustrate a snow scene and find pictures in books.

c. Pleasure. Winter sports. (Sleighing, coasting, building snow forms.)

d. Means of transportation, sleighing, lumbering, etc.

e. Eskimo activities dependent on snow.

Literature for Children:

Sharp, D. L., Winter:
- Things to See This Winter.
- Christmas in the Woods.
- Hunting the Snow.

Lovejoy, Nature in Verse, (Songs of Winter).
Bailey, For the Children's Hour (Winter).
L. W. Richards, Five Minute Stories.
- Gordon Third Reader, The Snowball, The Sun's Travels, Who Has Seen the Wind.
- Elson Third Reader, Signs of the Season.
- Aldine Third Reader, Winter Nights, Windy Nights, Jack Frost.
- Elson Reader, Book on North Wind at Play.
- Elson Primer, Who Likes the North Wind.

Teacher's References:

Dodge, Elementary Geography.
Brigham-McFarlane, Essentials of Geography.
Fabre, The Secret of Everyday Things.
Fabre, The Story Book of Science.
Trafton, The Teaching of Science, Chapter XVII.
Children's Museum, Pictures and Material, Eskimo, Types of.

TOPIC 5—ANIMALS THAT SERVE MAN, (BEASTS OF BURDEN). X. Y. Z.

Horse, Donkey, Oxen, Reindeer.

Activities

1. Let a discussion lead to the study of service animals the children have seen in the city, the zoo, and on the farm . Handwork may include the making of clay models, paper cutting or drawing of animals, and the making of animal booklets.

2. The following general problems may arise:

a. Differences between wild and domestic animals.
b. Needs of man that call for the domestication of animals.
c. Qualities of animals that carry or draw heavy loads.
d. Man, the master, the animal subservient to his will.
e. Sympathy between man and the animal.
f. The rights of the animals.
g. The displacing of animals by machines.

3. The horse, pony and donkey. Let the children compare horses used by policemen, firemen, hucksters, milkmen, and others, as to:

a. Care given by their masters, food, grooming, stables.

b. Coats, body, legs, feet, head and tail.

c. Necessity of iron shoes.

d. Alertness of eye and ear.

e. How the animal defends himself.

f. Distinctions between the horse and the zebra, ass, donkey and pony.

4. Oxen and reindeer.

The oxen at the State Fair and the deer at Belle Isle may be used as a method of approach. Where and how have each been used by man? Utilize the children's Christmas stories of the reindeer.

Literature for Children:

Elson Reader, Old Horses Know Best, p. 13.
Poulson, In the Child's World, "A Wise Old Horse," The Horse That Fed His Friend.
McMurry, Fifty Famous Fables, The Donkey and His Master, The Miller, His Son and Their Donkey.
Hopkins, The Sandman, His Farm Stories, The Oxen Story.
Poulsson, The Runaway Donkey.
Poulsson, Through the Farmyard Gate, An Obliging Donkey.

Teacher's References:

Shaler, Domesticated Animals, pp. 57, 204, and 218.
Comstock, Handbook of Nature Study, p. 206.
Downing, A Source Book of Biological Nature Study, pp. 215, 205.
Webster New International, Our Wonder Book, vol. III, pp. 186, 197.
Farm Life Readers, Book 5.
Segur, Sophie, The Story of a Donkey.
Hopkins, The Sandman and His Farm Stories.
Children's Museum, Pictures.

TOPIC 6—THE CHRISTMAS GOOSE. X. Y. Z.

Activities

1. If possible, plan to have the children see a live goose. Compare it with the chick and duck in size, form, plumage, locomotion and habits.

2. Have the children make drawings of the three fowls to express themselves in the comparative study.

Literature for Children:

Katherine Pyle, Stories of Humble Friends—Gray Wings.
D. L. Sharp, The Fall of the Year.

Teacher's References:

Comstock, Handbook of Nature Study, p. 136.
Shaler, Domesticated Animals, p. 152.
Children's Museum Pictures.

TOPIC 7—FRUITS FOR CHRISTMAS. X. Y.

Oranges.

Activities

1. Secure pictures of orange trees in blossom and sprays of orange blossoms from nursery catalogs, magazines, and other sources.

2. Have at least two types of oranges for study, the Navel and Florida oranges.

The children may note the following exterior features: (a) The form. (b) The roughness and thickness of the skin as compared with the apple skin. (c) The scar showing its attachment to the limb of the tree. (d) The imbedded miniature orange opposite the stem-end in the Navel orange.

From cross and vertical sections note the divisions that contain the juice in separate packets: (a) That these sections radiate from the center. (b) The location of seeds in the Florida and their absence in the Navel orange.

The amount of juice in an average sized orange may be measured after using a lemon squeezer.

Discuss the nutritional value of orange juice for children.

3. Apply to children's museum for pictures.

TOPIC 8—CHRISTMAS COLORS. X.

Activities

1. Let the children investigate in stores and out of doors the colors Nature has provided for decoration. They should find that the green and red predominate. Why are we oblige to purchase holly, ground pine, and other evergreens from the stores? Where and how, does each kind grow? In what form is each used in decoration? Let the children make the room beautiful for the Christmas celebration from natural materials.

Play guessing games? I am thinking of ———— description ————. Will some one name and find it?

Draw the holly leaf, and the pine needles in their typical clusters (2-5).

Literature for Children:

McMurry, Classic Stories—The Little Fir Tree, The Pine Tree's Secret.
Cook, Nature Myths.

Teacher's References:

George, Primary Plan Book—Winter.
Dobbs, Primary Hand Book.

Aquarium

In making an aquarium, *imitate nature.*

Four important considerations are:

1. The equilibrium between plant and animal life.

Animals do not thrive where plants are not growing.

The plants have three functions:

a. To supply food to herbivorous creatures.

b. To supply oxygen to animals.

c. To use the poisonous carbonic acid gas given off by animals.

2. Ventilation.

All animals need air. They get it from the water which contains air, from the water plants, and from the open surfaces of water. (A fish or a tadpole cannot live in a long-necked bottle.) If a fish stays with its mouth at the surface and body hanging down, it is being suffocated. Never allow scum on water—it shuts off oxygen and means death. Skim it off or change the water.

3. Temperature.

This should be between 40° and 50° Fahrenheit, and the aquarium should be protected from the bright sunlight.

4. Choice of animal life.

Use in still water, animals which live in still water, and in running water, those found in swift streams.

Do not overstock. It is better to have too few plants and animals than too many.

If a green slime forms, the ponds should be put in a shadier place. Snails will help clear it up. If everything is properly balanced so that the plants keep the water fresh and the animals keep the plants from multiplying too rapidly, the water need not be changed. Add water enough to make up for evaporation. Rain water is best.

Dead insects and dead plant matter may be removed with a medicine dropper or long glass tube. Dust may be removed (skimmed off the top) by laying piece of blotting paper on the surface for a moment.

Charcoal serves if a deodorizer or disinfectant is needed.

For class talks and other special studies, specimens may be removed to temporary aquaria—such as glass tumblers, small fruit jars, or any wide mouthed dish.

In the permanent aquarium put in a three-inch layer of clean sand. Add water plants and anchor them down with stones. Pour water (from the pond if possible) in very carefully—a rubber tube siphon is

very good to use. In the course of a few days, the plants will be giving up oxygen and supplying the carbon dioxide. The best plants to use are the Ca bomba, water milfoil, hornwort, bladderwort, water buttercups, ditch moss, eel grass, pond weed, all of which are flowering and have long slender thin leaves or leaves so cut up that their parts are threadlike.

The balanced aquarium should be stocked with plenty of water plants and a few animals.

Combinations for animal life in one aquarium:

I. A couple of minnows, two or three dragon fly nymphs, and a couple of snails.

II. Tadpoles and snails.

III. A few very small fish with water snails and fresh water clams.

IV. Medium sized cray fish and small water turtles. Be sure to furnish something upon which turtles can climb out of the water to breathe and sun themselves.

VI. Insects.

Many insects—both those that spend their entire lives in the water and those that are aquatic during only one stage.

Some of these are:

Predaceous diving beetle.
Water tiger.
Water scavenger beetle.
Water boatman.
Back swimmer.
Giant water bug.
Water scorpion.
Dragon fly.
Mosquitoes, etc.

Food for animal life. (Never leave an excess in the tank.)

Water snails. Bits of lettuce or cabbage, unless there is some green slime for them to feed upon.

Land snails and slugs. (Keep on wet sand.) Cabbage and lettuce leaves.

Fish. Crushed vermicelli, snail eggs, fish food, bread crumbs.

Minnows. Worms, bits of fresh meat, flies and other insects.

Crayfish. Snail and water insects.

Terrarium

Use about 3 or 4 inches of soil in the bottom, sink a pan of water at one end. Cover soil with moss kept very wet. Small ferns, partridge

berries, or wintergreen berries may be added. Part of the space may be covered with small pebbles for animals to sun themselves on. Cover with glass as wood plants soon dry out. Stock:

I. Turtles and crayfish.
II. Toad and garden snails.
III. Young garden snakes.
IV. Red salamanders.

Food:

Turtles—earth worms and raw meat.

Toads—caterpillars, earth worms and raw meat.

Snails—fresh leaves—as lettuce, etc.

Put salamander or frog eggs in a flat white dish with just enough clean, cool water to cover them until the tadpoles hatch out. When large enough, transfer some to permanent aquarium. Vegetable diet for polliwogs.

Teacher's References:

Teacher's Cornall Leaflet No. II. April, 1898.
Detroit Third Grade Nature Outline. Sept. 1914.
Cornell Rural School Leaflet. Sept. 1920.
Detroit Supple. Nat. St. Outline. 1913.
Handbook of Nature Study. Comstock.

January

Motive: Cold weather interests.

TOPIC 1—NATURAL FORCES DEMONSTRATED BY MECHANICAL TOYS. X. Y. Z.

1. Air and air forces.
   Balloons, flyers, aeroplanes, whistles, musical instruments, etc.
2. Spinning devices.
   Tops, gyroscopes and others of similar nature.
3. Clock-like mechanism.

Activities

1. The first day the teacher may stimulate the series of lessons by means of a carefully selected illustration of each of the three types, that may be discussed from the standpoint of the motor power. (What makes it go?)

A survey can then be made of the available Christmas toys representing each type that the children can bring. Limit the number, list the owners, and see that each is tagged with the owner's name and safely stored.

The value of the lessons will depend on the organized lesson plans that will stimulate purposeful activities on the part of the children, who may demonstrate in a simple way the construction and operation of each toy. It may lead to the construction at home or in class of tops, paper or wooden windmills, simple fliers, sail boats, whistles, and others.

2. Discuss the importance of air to the bird in its flight. Are its wings in constant motion? Compare with the windmill and toy aeroplane.

Teacher's References:

Turner, Romance of Aeronautics, p. 57.
World Book, p. 558.
Book of Knowledge, vol. 14, p. 393.
Work and Play—Mechanics Indoors and Out, p. 369.
Book of Wonders, p. 199.
Science and Invention, January and February, 1921, Bubbles.

TOPIC 2—AIR AND HEALTH. X. Y. Z.

Activities

1. Collect evidence to prove that air is essential to our motor power.

   a. We live in an ocean of air.

   b. What air makes us move briskly? (Fresh, cool, moving air.)

   c. What air makes us feel lazy and sick? (Stagnant, enclosed warm air.)

   d. Reasons for building our houses with windows, day and sleeping porches.

   e. Red cheeks and exhilaration after play-time out of doors.

   f. Benefits of summers spent in the country and at lakesides.

   g. Diseases most prevalent in winter after being housed.

2. Use the toy balloon that may be filled and exhausted through a mouthpiece to illustrate filling the lungs with fresh air and exhaling foul air. Conduct a breathing exercise in which the children place the hands on the chest while inhaling, then on the sides. Open the windows during at least a part of the exercise so they should be opened (top and bottom) in the sleeping room.

Measure the chest of one or two children during inhalation and exhalation to demonstrate how air makes the lungs expand just as the air in the balloon swells it up.

Emphasize the importance of having plenty of fresh air by an experiment: Place two plants in the window, one covered with glass to shut off the air, and the other having plenty of fresh air. Watch results after several days.

Lead to the conclusions:

1. That all air is not good air.
2. That air is as important in producing a motor power in our bodies as it is in some of the toys.
3. That the play hour out of doors is as important as good food.

Teacher's References:

Any good physiology.

TOPIC 3—PET ANIMALS AND THEIR WILD RELATIVES. X. Y. Z.

The Cat and the Rabbit.

Activities

1. The teacher may stimulate the class by starting a table-display of authentic books and good pictures of cats and rabbits and their wild relatives, such as:

Hornaday—The American Natural History.
Comstock—The Pet Book.
Shaler—Domestic Animals.
Miller—Four Handed Folk.
Monteith—Familiar Animals and Their Wild Kindred. (Am. Book Co.) 50c.
Sharp—Wild Life Near Home.
Stone and Cram—American Animals.
Westell—The Boys' Book of Pets.
Wright—Four-footed Americans and Their Kin.
The Natural Geographical Magazine, Nov., 1916 and May, 1918.
Pictures by celebrated painters in Perry Pictures.

To this collection the children may add some of their Christmas books on the same animal subject.

2. A cat and a rabbit may be kept in the room for a day or two where their habits may be observed.

Problems

1. To compare and find differences in appearance and behavior.
2. To discover to what extent each can take care of itself. (Suggestion for problem 2 taken from Trafton—Teaching of Science, p. 85.)

A. Obtaining food.
  (1) Kinds of food.
  (2) How found.
  (3) How caught.
    (a) Method of walking and springing.
    (b) Use of claws.

B. Protection.
  (1) From enemies.
    (a) Keen senses.
    (b) Claws.
    (c) Running away.
  (2) From cold weather.

(a) Fur.
(b) Finding sheltered spot.
(3) Cleanliness.

3. Application may take the form of further observations outside of school.

Handwork may consist of free hand cutting or clay modeling.

4. After a summary of the features of each of the tame animals, let the children search all available books and pictures for wild animals belonging to the (1) cat family, and (2) rabbit family.

If sufficient loose pictures can be assembled, begin a scrap book for the room.

Literature for Children:

Newbitt's Pussy and Doggy Tales.
McMurry and Cook, Doings of the Tree-Top and Meadow, pp. 52,294.
Poulsson, In the Child's World—The Cat Series.

Teacher's References:

Trafton, Teaching of Science, chapter VIII.
Comstock, Handbook of Nature Study.
Downing, A Field and Laboratory Guide in Biological Nature Study, pp. 56, 66.

TOPIC 4—BIRDS AS PETS. X. Y. Z.

Activities

1. Make a survey of the class to find the pupils having canaries in the homes. Let these constitute a group who will carry on activities connected with the canary study, while the remainder consider the pigeon. Each group can then teach the other group the results of their own study.

2. Canary. X. Y.

From several bird pictures let the children select those that most closely resemble the canary (the goldfinch and yellow warbler). The teacher can then show the museum specimen of the goldfinch.

Development—outline.

Problems

a. To compare the goldfinch or yellow warbler with the home canary.

b. To learn more about the habits of both birds.

Questions

a. Color and size.
b. Are all canaries the same color? (Best are pure yellow.)
c. Songs, length, time of day, variations in song, position of head.

d. Moulting.

e. Food.

f. Water for drinking and bath.

g. Other care necessary.

h. Note how the bird eats its seeds and drinks.

i. How does the bird sleep? Why does it not fall from the perch? Count number of toes and note their arrangement. Does it belong to perching or climbing birds?

If any have had nesting birds, let them describe them.

Why are canaries kept in the house while the goldfinches and others are in the open? Do goldfinches and warblers ever remain here winters?

Why are goldfinches called the thistle birds?

3. The pigeon. X. Y. Z.

While the other group is engaged in hand work the "Pigeon group" may begin their study. It may also be introduced by pictures and the museum specimen, or possibly a live bird brought in for the occasion. The discussion should lead to further investigation out of doors by the group or individuals. It may also become a continuous project to attract the birds to the school grounds till they become as tame as in other quarters of the city.

Problems

a. To learn how the pigeon differs in appearance and action from other birds.

b. To attract the pigeons about the school grounds.

Questions

a. How much larger is it than the robin?

b. Are all colored alike? Do you find any that are all white, brown, gray or blue?

c. What mixture of colors are found on some?

d. Do they walk or hop? Compare their walking with that of the English sparrow. Note the head motion.

e. Compare their legs with those of the other birds studied, walking, wading, swimming, and perching types.

f. In flight do they keep wings in motion constantly, or soar part of the time?

g. Relate experiences with birds in the parks where they may be fed from the hand.

h. What food would you bring to attract them to the school grounds?

i. Would you like to bring food and scatter it for several days, then have an outdoor lesson to watch them feed?

j. Why is it desirable to have pets that are allowed their freedom? Where do they sleep and make nests?

4. Let the individuals choose materials, paper, scissors, crayons, or clay to make something that will help them to teach the other group about the pigeon.

Literature for Children:

Poulsson, In the Child's World—The Pigeons, pp. 72, 81.
Thompson Seton, Animal Heroes, "Arnaux."
Sarah Orne Jewett, Songs of Nature—"A Caged Bird."
Miller, True Bird Stories.

Teacher's References:

Comstock, Handbook of Nature Study, pp. 45, 53.
Shaler, Domesticated Animals.
Children's Museum—Pictures and Keystone Stereographs.

TOPIC 5—THE SKY, WINTER, FROST AND ICE. X. Y.

Activities

1. Arrange some device by which the children can mark or count the days on a calendar when they can skate or slide on the ice during January.

2. Watch for the time when frost "paints" the windows and hangs heavily on the trees. Read Silvercap, King of the Frost Fairies. (For the Children's Hour.) A few branches may be brought in, shellaced, and confetti scattered over them to resemble the trees covered with frost. Think of other decorations that will suggest winter scenes.

3. If a January thaw occurs, make a study of icicles. Are they formed during the day when water is dripping or when everything is freezing? Cut out paper icicles to hang from the top of the blackboard.

4. Follow the moon through its phases. Try to discover during which phases it can be seen during the day. Where in the sky can it be seen when new, when full, and at what time of the day? In what direction do the horns of the new moon face? The old moon? Make drawings or cut out forms. Compare sunrise and sunset with moon rising and setting.

Literature for Children:

Longfellow, Snowflakes.
Cyr, The Children's Primer, p. 99.
Stepping Stones to Literature, 2nd Reader—The Children of the Clouds, A Snow Song.
Bender Primer, Lady Moon.
Baldwin and Bender, 2nd Reader—The Stars.
Elson Primer, Icicle Poem.

Teacher's References:

Comstock, Handbook of Nature Study.
Collins, The Book of Stars.
Bakkie, Peeps at the Heavens.
Proctor, Giant Sun and His Family.
Willis and Farmer, Month by Month—Winter.

February

Motive: Signs of life during the coldest month.

TOPIC 1—HOUSE PLANTS. X. Y.

Activities

Bring out pots of bulbs planted in the Fall. Place them in a light place and water daily. Let a different committee assume the responsibility of their care each week. Stimulate interest in the development by measurements and watching for the first appearance of the flower bud.

Add to the bulbs at least a geranium or primrose and a small Boston fern. The children may be able to bring these from their homes, or cuttings (slips) of geranium or sultana that will serve as a lesson on plant propagation.

It is desirable to obtain a blooming single geranium to study as a flowering plant and make comparisons with the fern that represents a large group of plants that reproduces by means of spores.

Problems

1. To discover as many facts as possible about the geranium plant, its flower buds, and flowers.
2. To learn why the ferns should be placed where the leaf tips, cannot be brushed and broken by people.
3. To locate the fruit-dots (sori) that contain the spores. Look on the backs of leaves for regularly placed bodies with shield-shaped coverings. (Do not confuse these with the plant enemies appearing all over the leaves of some plants.)

Problem 2 will necessitate answering the following questions:

a. Where do young leaves grow?
b. How do they unfold?
c. Where is the last and most delicate growing point to unfold?

(Growth is interrupted if this is broken off.)

After a study of the house fern the children will be prepared in interest for the woods—ferns that can be planted in May in the window box to open during the wild flower season.

Sweet pea, nasturtium, and orange seeds can be planted this month.

Literature for Children:

Elson Primary School Reader—Book One. The Little Plants.

Teacher's References:

Comstock—Handbook of Nature Study, pp. 643 and 684.
Parsons, How to Know the Ferns.
Tappam, The Children's Hour—Stories of Nature, Our Common Ferns.
Trafton, Science of Home and Community, Chapter IX.
Children's Museum—Pictures.

TOPIC 2—FEBRUARY SNOW AND SIGNS OF LIFE. X. Y.

Activities

Immediately after a fresh fall of snow plan a walk that shall have for its purpose a search for evidences of life, both active and resting. They may include the following:

1. Tracks. X.

a. Bird-tracks. Do they occur singly in straight lines, zigzag lines, or in pairs? Did the bird hop or run? Let three children demonstrate for the rest the course of tracks when running, walking and hopping. Determine the direction in which the birds were going by examining the tracks for heel and toe. Were the birds as small as sparrows, or as large as pigeons? Be able to draw representations of the foot prints on paper, or imitate them in fine sand, in tray or sand table.

b. Cat-tracks. (To be sure of finding these a child in the neighborhood can furnish a pet cat to observe its behavior in the snow as well as its tracks.)

c. Dog-tracks. Compare the tracks of the cat and dog and follow far enough to determine the variation in the gaits each animal has taken.

d. Rat-tracks. (These may occur in the vicinity of open garbage cans or even about the school grounds.)

Note: Notice the line between the foot-prints made by the tail. Find evidences of resting for an instant, also of leaping.

For a subsequent lesson the teacher can draw a series of the several types of tracks, including rabbit and squirrel tracks, on the blackboard, to create a problem for the children.

2. Plants seen above the snow. X. Y.

Weeds. Vacant lots may furnish an abundance of material. Examine plants for seeds. Collect a few of the remaining seeds.

Shrubs. Examine the branches for buds. When were these formed? What are they doing during the winter? Bring a few branches into the school room and place them in water to watch development.

Trees. Look for signs of life on trees, especially noting buds on the Horse Chestnut, Poplar, Maple and Elm.

Bring in branches of these to study more closely and observe developing buds.

That sap is ascending from roots to the branches in the maple is evidenced by the wet spots on the sidewalk underneath the tree. The sap is dripping from broken branches.

Story, "Who Discovered Maple Sugar?"

Teacher's References:

Tappan, The Children's Hour—Stories of Nature, Snowflakes Under a Microscope.
Cornell, Rural School Leaflet, January 1920-21.
Comstock, Handbook of Nature Study.
Cornell Rural School Leaflets.
Children's Museum—Pictures—Animal Tracks, Weeds—Branches of Maple, Poplar and Elm.

TOPIC 3—GOLD FISH AND OTHER AVAILABLE FISH. X. Y. Z.

Activities

The teacher can introduce the subject by a story of the family life of fish, also of the native home of the gold fish and its changes under the new environment.

Have ready for study one or more gold fish in bowls or aquaria and other kinds, if possible. Place where all can see. Let the children state facts learned from observation and ask questions. Write on the board a list of the best statements and another of the best question. Wherever possible let them find answers to their own questions. The following should be included:

1. How does the fish glide so easily through the water? (Compare with a wet melon seed.) Does the shape help?
2. Count number of paired and single fins. Do any act as arms and legs? What purpose does each serve?
3. What stiffens the fins?
4. How does the fish breathe under water? Why should the water be fresh? Note the opening and closing of the mouth and gill covers. (Powdered chalk in the water will reveal water currents from the gills.)
5. How do the eyes differ from our eyes?
6. Do the scales follow any special plan of arrangement?
7. Are all fish covered with scales? (Bullheads and catfish.)

Model the body and attach paper fins, or draw a fish.

Literature for Children:

Poulsson, In the Child's World—Fishes.

Teacher's References:

Comstock, Handbook of Nature Study, p. 149.
Baskett, The Story of Fishes.
Johonnot, Neighbors with Wings and Fins.
Holder and Jordan, Fish Stories.
Jordan, Science Sketches—The Story of a Salmon.
Holder, Half Hours with Fishes, Reptiles and Birds.
The World Book, Fish.
Children's Museum.
Cornell Rural School Leaflets, March, 1920.

TOPIC 4—THE COW AND THE PIG. X. Y. Z.

Activities

The Cow.

Collect as many pictures of cows as possible.

Note the three common types: Jersey, Holstein, and Guernsey, and the colors characteristic of each.

Compare with other hoofed animals.

Peculiar cow habits of chewing her cud, method of lying down and getting up. Food.

Problem

To find various uses of cattle to man.

If desirable, the teacher can use this opportunity to give a special lesson on milk. See Milk pamphlets.

A group of children who have visited a dairy farm may carry on a project of constructing a miniature dairy farm.

Another group may depict the care given milk from the time it leaves the farm till it arrives at our door.

The Pig.

Develop the subject to bring out the superior qualities of the animal, rather than a mere pork-producing and mud-loving animal.

Determine the number of references that have been made to the pig in Mother Goose and other children's books. Investigate school readers with the same purpose.

Literature for Children:

Bailey, For the Children's Hour, p. 50, 307.
Baldwin and Bender, Second Reader—Milk and Butter.

Teacher's References:

Comstock, Handbook, pp. 295, 307.
Trafton, Teaching of Science, p. 86.
Cummings, Nature Study, primary Grades.
Burkett, Our Domestic Animals.
Poulsson, In the Child's World—The Cow, p. 157.
Children's Museum.

TOPIC 5—THE MAGNET AND IRON. X. Y. Z.

Activities

Purpose: To play with the magnet and discover as many articles as possible that are made of iron.

1. The children and teacher may cooperate in assembling the following articles: bar and horseshoe magnets; pieces of metals, such as iron, steel, tin, zinc, a dime, a copper, a nickel, iron filings, black and

white pins, darning needles, steel knitting needles, tacks, pens, etc., also sheets of paper, cardboard, tin, glass and wood.

2. Let the children work in groups, with a pile of articles and at least one magnet for each group. Draw out the articles and arrange in rows in the order of their response to the magnet. List all articles that are found by the groups to be magnetic, and develop the conclusion that they are all iron or steel.

3. Mark off inch intervals on strips of paper. Place an article at the end of a strip and find the distance where magnetic influence ceases.

4. Lay tacks, iron filings, or needles on the sheets of various substances provided in (1) and test the action of magnetism through each.

5. Lay a magnet under a sheet of paper and scatter iron filings or black sand over the paper. Also, lift the paper with its evenly scattered filings and run the magnet around under the paper in such a manner as to produce initials among the filings.

6. Make magnets out of darning and knitting needles, and nails by rubbing one end several times in the same direction on one end of the magnet, then the other end of the object on the other end of the magnet. Try to pick up iron filings with the new magnet.

7. Suspend a needle magnetized as above from a thread and see if it will behave like a compass needle.

(The above experiments have been adapted from Trafton—The Teaching of Science.)

Literature for Children:

Howliston, Cat Tails and Other Tails, The Magnet's Choice.

Teacher's References:

Hunter and Whitman, Civic Science in the Home, Chapter XXII.
Collins, The Book of Stars, pp. 76, 79.
Comstock, Handbook of Nature Study, 838.
J. H. Fabre, The Story Book of Science—Metals.
Rocheleau, Geography of Commerce and Industry, Chapter IX.
Children's Museum—Magnets and Pieces of Iron.

March

Motive: What do the March winds bring? Watch! Listen!

TOPIC 1—THE WINDS THEMSELVES. X. Y. Z.

Activities

The teacher can draw or hang a picture on each of the four walls that suggest a type of wind. The west wind brings fair weather and sunshine, the north suggests cold and snow, and makes us bow the head, the east wind is damp and bites the face, the south winds brings with it warmth, green grass and birds.

"Whichever way the wind doth blow
Some heart is glad to have it so.
Then blow it east or blow it west,
The wind that blows, that wind is best."

The children can express their ideas of different winds in hand drawings.

Problems

What wind brings the rainbow?

Who will report the first rainbow of the Spring?

Literature for Children:

Howliston, Cat-tails and Other Tales, Old Sol's Rainbow.
R. L. Stevenson, The Wind.
Eugene Field, The Wind.
Poems by Grades, Primary—Blow Winds of March.

Teacher's References:

Poulsson, In the Child's World, pp. 60, 72.
E. C. Stedman, What the Winds Bring.

TOPIC 2—THE EARLY BIRDS, BLUEBIRD AND ROBIN. X. Y. Z.

"Hark 'tis the bluebird's venturous strain. . .
Telling us Spring has come again!"

"From the elm-tree's topmost bough,
Hark! the Robin's early song!
Welcome tidings dost thou bring,
Little harbinger of spring,
Robin's come!"

Activities

Use blackboard drawings, colored pictures, and museum specimens for the objective study of these birds. Devise means of impressing the children with the exact size of the robin that they may use it as a standard, along with the English sparrow, by which to judge the sizes of other birds.

Use the names of the bird-parts as the colors are described: (1) head—beak, crown, throat; (2) body—back, rump, breast; (3) wings; and (4) tail; (5) legs and feet.

Collect data as to the places the birds are seen,—the tree-top, house-top, telephone wire, or ground. Do they sing at all times of day or only morning and evening?

Draw on the backboard, or construct from heavy paper, a tree several feet high upon which to place pictures of different birds as they are studied according to the places they most frequent.

The teacher can make an investigating tour of the school neighborhood to locate last year's nests, then take the children for a walk to see these before the trees develop their foliage. This may lead to the problem: Do the robins occupy old nests?

Schools in the newer sections may have better opportunities to study the bluebird in the open.

To practice on estimating of size and form both teacher and pupils can cut out paper robins and measure them for most accurate ones. These can then be colored.

Lay especial stress on the peculiar habits of each bird, its food and how located; running, walking and hopping; nest building and materials selected.

Lay the foundations for a bird study project that will continue into the summer.

Literature for Children:

Mott and Chubb, Indoors and Out—Robin's Apology.
Lucia, Peter and Polly, The First Bluebirds—Polly's Robin.
Various Readers, How the Robin Got His Red Breast.

Teacher's References:

Comstock, Handbook, p. 58.
Barrows, Michigan Bird Life, pp. 721, 729.
Chapman, Bird Life.
Moseley, Trees, Stars and Birds, 271, 274.

TOPIC 3—THE CROAKING FROGS AND THEIR EGGS. X. Y. Z.

Activities

In quiet pools in the country and outskirts of the city may be

found the congregated frogs announcing the season of egg-laying. The eggs are deposited in masses of jelly that can be lifted by means of a long-handled net or strainer. Carry them in a quart jar at least half filled with the water from the pool. They may be placed in the fish bowl or aquarium to which is added some green water plants. Keep out of the bright sunlight. Do not include too many in a bowl.

General problem: What happens during the egg's development into a tadpole?

Teacher's References:

Downing, Source Book of Biological Nature Study, p. 41.
Comstock, Handbook of Nature Study, p. 93.
Dickerson, The Frog Book.

TOPIC 4—SECURELY WRAPPED PARCELS REVEAL THE LIFE WITHIN. THE BUD, BULB, SEED, AND EGG. X. Y.

Activities

1. Let the children see and examine a collection of various kinds of seeds; short sections of branches with buds, as poplar and willow; a few bulbs; and a hen's egg, to note the fact that each is well covered in its own particular way.

2. The signal to awake:

Simple experiments to prove that heat, not light, stimulates growth in the seed, bud, and bulb; bury seeds in moist cotton or sawdust and place in a warm, dark closet, together with a fresh poplar or lilac branch in water. At the same time place another set of seeds and branches in a light and warm location to prove that light produces the green. Recall the treatment given the bulb to make it develop.

The children may dramatize the awakening by cuddling down under heavy coats or blankets to represent the seeds, and buds. When the wrappings become too warm and too small for comfort they stretch up hands and head till the wrappings are loosened and finally discarded.

The influence of moisture on seed development may be demonstrated by a comparison of dry and moist seeds under the same temperature conditions.

3. The egg and the chick.

Just before Easter let the children construct a nest of dead grass to represent the hen's nest. Place in it a few eggs. Why does the mother hen sit so patiently on the nest for many days? Stress the bursting of the shell by the chick as it comes to its new world. Create in the child's mind a reverence for the unfolding of new life. Why should we protect all birds' nests?

Literature for Children:

Poulsson, In the Child's World—The Story of Speckle.
Howliston, Cat-Tails and Other Tales—The Little Brown Seed, The Lilac Buds.
Rose Licia, Peter and Polly in Spring—"Pussy Willows."
Bailey—For the Children's Hour, Book 1—Little Half Chick, The Little Red Hen.

Teacher's References:

Comstock, Handbook, pp. 41, 43.
Visual Education Primary Set, Seasons.

TOPIC 5—THE EARLY CROCUS, WILLOWS AND HEPATICA. X. Y. Z.

Activities

Every first grade room can have its willow branches and the children should be kept alert watching the "pussies" (catkins) doff their winter caps. Collect a few of the fallen caps and try to fit them on the catkins. Why do they no longer fit? Keep the water fresh and follow the development until the catkins become yellow, because they contain the stamens with the yellow pollen, or green, the color of the pistils becoming the fruits with their hairy seeds.

Do the leaves appear at the same time as the catkins? It would be desirable to have branches of several kinds of willows that develop at different times and show variation in bud contents.

The willow usually announces that it is time to look for the hepatica in the woods where it has not been destroyed by thoughtless flower hunters. (Begin talks about the preservation of the wild flowers. Flowers may be picked, but the roots should not be disturbed.) Use pictures of the hepatica if the flowers are not available.

Closer at hand in many gardens and lawns may be found the crocus pushing its blossom through the ground. Do its leaves venture through at the same time? Study this as a bulbous plant, the bulb of which was formed a year ago to be ready for early spring development this year.

Teacher's References:

Stalk, Wild Flowers Every Child Should Know.
Morley—Flowers and Their Friends.
Bailey, For the Children's Hour—The Snowdrop, p. 91.

TOPIC 6—GARDEN SUGGESTIONS. X. Y. Z.

A. Seed catalogs:

Let the children decide on the best use the class can make of old seed catalogs.

B. Garden tools:

Secure the loan of a spade, hoe, rake, and garden-trowel. Let the children work out a pantomine demonstration of the use of each tool in the order given to illustrate the progressive steps in preparation of the garden.

Drawings can be made of the tools, silhouettes cut from paper and pasted on paper of contrasting colors.

C. Egg-shell Garden.

Let each child bring an egg-shell half filled with loose blank soil. In this he can plant one or two nasturtium seeds. The shells can be assembled and partly buried in a flat box of sawdust or sand to be cared for in the room. When the nasturtium is ready for transplanting, the shell and its contents may be planted in the garden without disturbing the roots.

Teacher's References:

Comstock, Handbook, p. 495.
Seed Catalogues.

April

Motive: Spring Awakes.

TOPIC 1—SUNSHINE AND SHOWERS. X. Y.

Activities

How do April showers prepare for the May flowers? During a hard shower let the children watch the rain beat against the windows and the hard ground. All winter the ground has been frozen and stiff, but the sun shines and warms the surface, the rain softens it only a few inches at first, then runs off in streams. Watch the water as it rushes away into the sewers. How does the sun help in taking back a part of this water to make clouds for another shower? After many showers and many hours of sunshine the ground has become softened and the frost has left the earth as the ice has left the river. How do all sleeping plants respond? The flower buds are ready for the first signal. Their blanket of leaves can no longer cover them, for they push their

heads up through the leaves and open their petals to the sunshine. Are there leaves on the trees when the first wild flowers come?

Not only does the sun follow closely in the wake of the shower, but he breaks through the clouds and makes a prism of every rain drop, so that every boy and girl can see a rainbow in the sky. (Read "Old Sol's Rainbow" in Cat-Tails and Other Tails.)

The children may express their ideas of a typical April day by means of colored drawings or by dramatization.

A smoked glass can be placed in the window through which the children can look at the sun.

Literature for Children:

Art Literature Reader II.
Horace Mann Readers II.
The Merrill Readers II.
Gorden Reader III.
Lovejoy, Nature in Verse.
R. L. Stevenson—"Rain, Little Raindrops."
The Robins Sing In the Rain.
If All Were Rain and Never Sun.
Spring Song, April Shower.
Merry Rain.

TOPIC 2—THE EVENING SKY.

Activities

1. The moon. Make regular observations of the moon to discover things not noted before.

2. The evening star. Venus, a sister planet like the earth, is lighted like the moon, by the sun, but it appears to us much smaller because it is farther away. Venus sets early in the evening in the west.

TOPIC 3—THE AWAKENING OF THE MOTH. X. Y. Z.

Activities

The cocoons brought in during the fall and winter should be kept in sight where all can watch for signs of life. If fortunate enough to have several kinds, the cecropia, promethea, and the polyphemus, each child should associate the moth and its cocoon and the places where they spent the winter, i. e., the name of shrub or tree. If kept in an open jar or cage, the female may lay eggs. Provide twigs to which the moths may cling.

The children can learn the names of the moth-parts: head, eyes, antennae, body or abdomen, and six legs.

Carefully cut open one cecropia cocoon so as not to injure the con-

tained pupa. Note the toughness of the silken covering and its lining. Try to distinguish parts of the moth impressed on the surface of the pupa. Leave the pupa wrapped in cotton for observation during its development.

Teacher's References:

Comstock, Insect Life, pp. 193, 330.
Downing, Source Book of Biological Nature Study, p. 68.
Dickerson, Moths and Butterflies.
Elliott and Soule, Caterpillars and Their Moths.
Holland, The Moth Book.

TOPIC 4—THE POPLAR "TAILS." CAROLINA POPLAR OR COTTONWOOD. X. Y.

Activities

When the poplar tree flower-buds are ready to burst, locate a tree in the neighborhood of the school that the children can watch on their way to school. The first ones to report that the catkins are out may be made a committee to lead the class there on an observation trip.

Possible Observations

Color of the catkins.

Do all branches bear catkins? Do all poplar trees bear catkins? Are they all alike?

Are there other buds yet unopened?

Examine the shape of the tree to be able to recognize it again.

If the staminate (red) catkins are beginning to fall each child might carry one back to the school, to study more closely. Each red ball contains pollen, and is a part of the stamen. There are many stamens on each tiny disc, or bracket, under a fringed scale. The tree in some localities may bear the seed-producing flowers that look "like a string of little, greenish beads loosely strung."

The special tree under observation should be followed closely in its later development until all the leaves are out and the children can tell the story of the tree.

Drawings may be made to illustrate:

1. The tree in bud.
2. A single catkin.
3. A single leaf.
4. The tree in full foliage.

Later observations may include a search for other trees with catkins.

If the Lombardy Poplar grows in the vicinity include it for a comparison of tree-forms.

Teacher's References:

Comstock, Handbook, pp. 770-773.
Downing, Source Book, pp. 318-321.
Moseley, Trees, Stars and Birds, pp. 74-79.
Otis, Michigan Trees.
Rogers, Tree Book.

TOPIC 5—SEED PLANTING-TIME IN FARM AND GARDEN. X. Y. Z.

Activities

The consideration of soils, garden tools, seeds, and seed germination during the preceding weeks has prepared the way for planting plans and actual planting.

Seeds suggested for planting: Sweet Alyssum, Zinnia, radish, beet, oats, corn, and garden peas.

Possible Projects

A model farm on the sand table with miniature garden and fields planted with a few kinds of typical garden, flower, and grain seeds.

A city home and garden with proper landscaping ideals.

Farm booklets.

Literature for Children:

H. L. Brown, In the Heart of a Seed.

Teacher's References:

Farm Magazines.
Country Gentleman.
Country Life in America.
Garden Magazine.
Lovejoy, Nature in Verse, The Seed.
Bailey, Garden Making.
Bailey, Manual of Gardening.

TOPIC 6—MORE BIRDS ARRIVE. X. Y. Z.

1. The flicker, or the goldwinged woodpecker.
2. The robins are busy with nest-building.

Activities

1. The Flicker. Secure from the museum the flicker and one other woodpecker that they may be compared after the former has been thoroughly studied.

Burroughs describes the flicker call as the "Proclamation of peace and goodwill to all. His April call is his finest touch, his most musical expression."

Where does he secure his food? Where is the nest built?

How is the flicker distinguished in flight from the meadow lark? Look at his rump.

2. Robins. Stimulate the children to watch for robins that are building their nests. When one has been located in the neighborhood of the school the class might adopt it as a class project. Data may be collected that will include:

Location in the tree.

Materials used. How assembled and shaped.

Egg laying and incubation.

Care of the young in the nest. The number of worms carried to them in a given time.

Learning to fly.

3. Interest in the family life of the robin may lead to the desire on the part of the children to set out basins, erect bird baths of concrete, and build bird homes for other birds.

Literature for Children:

"Oh, the flicker! he is here—
April's hardy pioneer!
Soul of young hilarity,
He's the bird, the bird for me!"
Danske Dandridge.

Cooper, G., The Robin's Nest.
Cary, P., Naughty Little Robin.
Kellogg and Heath Animal Stories—"How the Robin Got His Red Breast."
"The Blue Bird."

Teacher's References:

Burroughs, Wake Robin—"The Return of the Birds."
Dugmore, Bird Homes, Nature Library, p. 104 and p. 120.
Our Wonder World, Volume III, p. 89.
Out of Door Book, The Children's Hour, The Baby Robin.

TOPIC 7—FRUIT TREES IN BLOOM. X. Y.

Activities

Try to have sprays of as many kinds of fruit trees in bloom at one time as possible. Each child should have the opportunity to examine a single flower.

Problems

Location of the fruit.
How the bees help.
How the petals help.
How the sepals help in the bud-stage.
Why the other parts fall and leave only the center.
Time required to grow and ripen the fruit.
Do the leaves come with, or after, the blossoms?

Shape of the tree. Distinctions between the apple, peach, cherry, and pear trees. Make drawings.

Planting apple trees from apple-seeds in flower pots or garden.

Why do we often find small apple and peach trees growing in vacant lots? Try to locate some of these. They are called seedling trees.

Teacher's References:

Comstock Handbook, pp. 778-785.
Hunter, A Civic Biology, pp. 35-43.
Coulter, Elementary Studies in Botany, pp. 131, 156 and 388.
Morley, A Song of Life, Flowers.

TOPIC 8—GUINEA-PIGS OR CAVIES AS PETS. X. Y. Z.

Activities

Make an effort to have a pair of guinea-pigs in the room for about a month during the spring that the children may make daily observations and learn to care for the animals. They can be taken home by children over week-ends where they will be given proper care. It is claimed that rats and mice will not infest buildings or houses where cavies are confined. "Their hutches should be large enough to afford plenty of space for moving about freely, and in good weather they should be placed in boxes, with a wire netting top and no bottom, which may stand on a plot of grass. Regular feeding, cleanliness, and proper food and bedding are the most important points. In cold weather they should be housed in a fairly warm building, and given plenty of clean straw, sawdust, or dry sand."

"Cavies will eat almost any vegetable food. Sweet hay should be placed in a rack within easy reach for food. Bread and milk squeezed dry is good for the morning meal, also a few oats. For midday, feed green food." A dish of clean water should be provided regularly.

Let the questions and problems concerning these animals come from the children. At the end of the period of study the children should be able to tell stories about them that will be based on their own experiences.

Teacher's References:

Verrill, Pets for Pleasure and Profit, Chapter III.
Downing, Source Book, pp. 197-217.
Knight and Jenks, Animals of the World for Young People, p. 137.

May

Motive: The Month of Colors.

TOPIC 1—THE WILD-FLOWERS OF THE LAWNS AND VACANT LOTS. X. Y. Z.

Activities

Each child's problems:

1. To pick as many dandelion flowers as possible.
2. To dig up as many dandelion plants as possible.
3. To find as many as possible of other wild plants that blossom in lawns and vacant lots.
4. To learn why we may pick these flowers and destroy the plants.

At the height of the blooming season of dandelions the children should be encouraged to bring the blossoms to fill vases, bottles, cans, and any available receptacles in the school-room. In a common box of soil a number of dandelion plants can be placed to continue their development during the study. Each group or row of pupils should be supplied with an uprooted plant to examine. An enlarged drawing of the entire plant may be placed on the board or a chart made to guide in the location of plant parts. The children may make colored drawings of the plant in bloom.

Find:

The long, sturdy tap root that grows straight down into the ground.

The slender branch roots that run into the ground on all sides to gather food and hold the plant firmly. Why is it difficult to pull up the plant?

The very short stem to which the many leaves are attached.

The largest and the smallest leaves with their jagged edges.

Notice the different positions taken by the leaves in the lawn and in tall grass. Taste a leaf to determine its flavor. Why do we cook the leaves for greens? Find the young buds. The different stages of flowering. The fruits.

To study a flower head (Only X.):

Let each child have a specimen to make curls of the hollow stem by splitting it into halves and rolling it back against the

tongue. After comparing the curls, the splitting can be continued upward through the flower-head to divide it into halves. They are now ready to pick out the tiny flowers and find that each carries its own seed-box at the bottom attached to a little "feather-duster" (the seals).

Find how these tiny flowers are wrapped in a blanket of little leaves (bracts) that protect them in the bud and also while the seeds are growing larger after the flowers fade.

Leave the children with problems at the end of a lesson period to be solved individually and reported on at the next lesson. These may be:

What becomes of the yellow flower-parts?

What happens to the "feather-duster"? (It elongates its stem or handle.)

Find little "pin-cushions" full of them.

What becomes of the seeds?

Literature for Children:

Bailey, The Children's Hour, The Dandelion.
Craig, Nature Study for Boys and Girls, Grade III.
Jenkins, Interesting Neighbors, Some Ways of the Dandelion, p. 152.
Meyers, Peter and Polly in Spring, Dandelion.
Meyers, In the Green Field, "Sun Gold," p. 60.

Teacher's References:

Comstock, Handbook.
Any High School Botany.
Beal, Flower Love and Legend.

TOPIC 2—VIOLETS AND PANSIES. X. Y.

Activities

Materials: A strawberry box of pansies, another box with a violet plant, a bouquet of violets and possibly some yellow violets.

Make a comparative study of the two kinds of plants and their flowers.

Problems

Could the violet and pansy be called cousins? If so, why?

Locate the horn (spur) where the bee finds the nectar.

Is it present in both? Do the leaves and flowers grow on a stem above ground or from an underground stem?

Notice that the pansy leaf has several parts while the violet leaf blade is heart-shaped.

Should these violets and pansies be planted in the garden?

Make colored drawings of the faces of the two flowers. Notice

that one pair of petals is at the top, one pair at the sides, and the single one hangs down.

Literature for Children:

Cather, Educating by Story Telling, The Little Step Mother, p. 227.
Meyers, In the Green Wood—"How We Came to Have Yellow Violets," p. 132.
Baker and Carpenter, Third Year Language Reader, p. 85.

Teacher's References:

Comstock, Handbook, p. 515.
Coulter, Elementary Studies in Botany, pp. 405-6.

TOPIC 3—PEANUTS FOR THE GARDEN. X. Y. Z.

Activities

The children's interest in peanuts naturally leads to questions as to how they grow. Raw peanut seeds may be germinated and the early stages of the seedling watched, and possibly drawn. Notice that, unlike the ordinary bean, the thick halves (cotyledons) are not carried above the ground. Let as many children bring their own raw peanuts as care to start them in the school and carry them home later to plant in the garden. If well cared for during the summer, the plants can be exhibited in the school next fall. They grow best in a sandy soil.

TOPIC 4—PURPLE MARTIN, SCARLET TANAGER AND QUAIL—X. Y. Z.

Activities

Martins

In certain sections of the city and often in the country, colonies of martins are attracted by many-roomed bird houses set on high poles.

Their sociable tendencies, their benefits to man as insect-eaters, and their swallow-like features in form and swiftness of flight should be emphasized.

Tanager

The scarlet tanager can not be confused with other birds as it is the only one that is found in this locality with red body and black wings and tail, though its mate is olive green. After studying the museum specimens and pictures the children can be on the alert to observe them in the trees, where they obtain the most of their food. They also catch many insects in flight. This bird affords an opportunity to stress the difference in the color of plumage shown by the male and female. The female is olive-green above and yellowish below, the wings and tail grayish.

Quail

The quail with his white throat and "Bob-White" note is unfortunate enough to be killed for food by man, and is thus considered one of the game birds. He busies himself all summer eating injurious insects and weed seeds which makes him far more valuable to the farmer than when his small body is used for food.

The quail can be taught as a ground bird and compared with the chicken in feet, legs, and shape of body as well as in its habit of nesting in the grass.

Literature for Children:

Burgess, Bird Book.
Patch, Bird Stories.

Teacher's References:

Barrows, Michigan Birds.
Job, How to Study Birds.
Forbush, Useful Birds and Their Protection.
Wright, Mabel Osgood, Birdcraft.
Eckstrom, Fannie Hardy, The Bird Book.
Audubon Leaflets.

TOPIC 5—THE MISCHIEVOUS RED SQUIRREL OR CHICKAREE. X. Y. Z.

The Gray Squirrel, a more Friendly Creature.

Activities

The children can begin to distinguish between these two squirrels and their habits. The food of the red squirrel includes nuts and grains like other squirrels. But he often eats birds, their egg and young, insects, young twigs, and fruits. What are its other features?

The gray squirrel is better behaved and more welcome in the parks and woods. The children may recall watching its pranks when they fed it peanuts. Besides the museum specimens and pictures used in the study, it may be possible to obtain a pet squirrel for a day or two.

Estimate the length of the body of each squirrel when full grown. For a comparison measure the heelless shoe of a six-year-old child, and the distance from the tip of the little finger along the palm to the bend of the elbow. The eight-inch shoe is the length of the adult red squirrel's body not including the tail. The gray squirrel's body could rest on the child's lower arm when its nose is at the little finger tip. Its tail would reach from the elbow to the shoulder. Compare the fore paws and legs with the hind legs and paws. How can the squirrel run along slender branches and wires?

Recall the rat and mice features and compare these with corres-

ponding features in the squirrel. Cut out or draw the bodies of several rodents studied, omitting the tails. Cut out separate tails for each and play the game of pinning the tail on the animal to which it belongs.

Literature for Children:

Bartlett, Lillian. Animals at Home. Mrs. Gray Squirrel.
Taft, Grace D. The Animals That Work. The Squirrel.

Teacher's References:

International Encyclopedia.
Hodge, Nature Study and Life.
Comstock, Handbook.
Burroughs, J. Squirrels and Other Fur Bearers.
Our Wonder World, Vol. III, p. 41.
Kellogg and Heath, Animal Studies.

Activities

Locate ant hills between the walk and the curb and take the children for a walk to study them. See if each child can find a hill to claim as his own special problem for learning all about the activities of the ants. "If it is near the middle of the day, or a little later, the ants will probably be found busily bringing little grains of sands up from the nest to the surface and dropping them on the heap that surrounds the entrance. Then each ant picks up another grain and carries it back into the nest." After the grains are warm from the sun they are packed around the eggs in the nest. Why?

In order to transfer a colony of ants to the school-room where they may be more closely studied, follow directions given in Downing's Sourcebook of Biological Nature Study, p. 102. "Put as large a tumbler as possible, mouth down, in a wide-mouthed fruit jar. Put rotten wood or dirt, together with ants, eggs and larvae that have been collected, into the pint jar and shake the material down so it will lie between the tumbler and the outer wall of the fruit jar. The ants will construct the passages and the chambers of their nests in the narrow space.

Cover the outside of the jar with black cloth or paper, which may be removed when the ants are under observation. See Comstock's Handbook for observations in an artificial nest.

The teacher can draw a circle on the board and place on it at proper intervals drawings to represent the life history and variations in ants, as:

1. A small oblong egg.
2. An elongated larva like a rice grain pointed at one end.
3. A yellowish pupa like a grain of wheat.
4. A small ant, a large ant, and a winged ant (ready for the marriage flight).

The children can be stimulated to be on the alert to discover many different kinds of ants living in different places, under stones, in

decayed logs, running up peony plants and fruit trees. They may discover the ants' cows (aphids or lice that the ants protect on plants in order to obtain the sweet fluid, honey dew, which they exude when the ants stroke them gently).

The stages in the ant's life history can be compared with the similar stages in the moth.

Literature for Children:

Young Folks' Library. A Book of Natural History.
Harper III. Talk About Ants.

Teacher's References:

Comstock, Handbook.
Comstock, Manual for the Study of Insects.
Kellogg, American Insects.
Jordan, True Tales.
Downing, Source Book.
Morley, M. W., Butterflies and Bees. The Ant Folk.
Kellogg, V. L., Insect Stories. A Clever Little Brown Ant.
Beard, Appleton's Home Reading Book. Curious Homes and Their Tenants, pp. 68-81.

TOPIC 6—SNAKES. SPECIAL TOPIC

NOTE—This topic is introduced for the express purpose of acquainting the children with the harmless snakes and to counteract the unnecessary fear encouraged by their elders. Of the sixteen kinds of snakes in Michigan, only the rattlesnake is to be feared. All the others may be handled without fear. For the benefit of teachers who wish to become acquainted with the identification features of the common Michigan snakes, the following simplified key has been prepared by a snake specialist at the University of Michigan.

a. No pit between eye and nostril. Tail not terminating in a rattle.
b. Anal plate divided.
c. Scales on back keeled (occasionally very faintly, i. e., with median longitudinal ridge on each scale).
d. Unicolor or striped.

Brown above, mid-dorsal stripe.
Dekay's Snake.

Dark brown-black above, red belly.
Red-Bellied Snake.

Chocolate brown above with a light yellow band on side,—belly dull yellow with two parallel brown bands.
Leather Snake.

Spotted or blotched.

Snout greatly developed and protruding upwards.
Hog-Nosed Snake ("Puff Adder")

Color above black or black with very faint blotches.
Pilot Black Snake.

Color above light brown to yellow with cholocate brown blotches.

Fox Snake

Color above dark brown with nearly square darker brown blotches in three series—one dorsal and one on each side.

Water Snake.

Dorsal scales smooth.

Color above, grass green (no markings).

Smooth Green Snake.

Black brown above—yellow-cream collar.

Ring Necked Snake.

Light gray-blue, green-blue or olive.

Blue Racer.

Anal Plate entire (not split).

Dorsal scales smooth, blotched.

Milk Snake.

Dorsal scales keeled—striped. Stripes cream color—edge belly brown—yellow spot in front of eye, stripes on rows 3 and 4.

Ribbon Snake.

Stripes greenish—rows 2 and 3.

Garter Snake.

Stripes yellow or greenish—on third and part of second and fourth rows. Color above dark olive brown. Head not distinct from neck, i.e., approximately same width.

Butler's Garter Snake.

A distinct pit between eye and nostril—tail with rattle.

Massauger or Rattlesnake.

(ONLY POISONOUS SNAKE IN MICHIGAN—ALL THE OTHERS MAY BE HANDLED WITHOUT FEAR.)

Activities

Interest the older boys in the school in the task of preparing a wooden box with a tight cover of either glass or wire screening. A small hinged door at one end or side of the box fastened with a hook will afford opportunity for feeding the snakes and insure against the occupants lifting the cover and escaping into the room. Tack screening over air spaces if glass top is used. The boys can then capture

desirable specimens for the box. The green snake is especially adapted, though others can safely be used, especially little brown snakes. They feed mostly on worms and insects. Try also fresh meat. Include sand or hay and a dish of water in the bottom of the box.

It is not necessary to conduct formal lessons on the snake, but if the children learn to feed it, become fascinated by its movements, scale covering, open mouth and extended forked tongue ("probably used for touch, taste, smell and hearing") and perhaps touch it without fear, the real purpose of the study will have been realized.

The teacher can tell the story of the life-history of snakes and their habits of crawling into crevices in rocks and holes in hillsides to sleep winters below frost level.

Counteract the ideas that snakes must be killed. Return the specimen snakes to their native haunts.

Teacher's References:

Ditmars, The Reptile Book.
Hodge, Nature Study and Life.
International Encyclopedia.
Comstock, Handbook.
Herpitology of Michigan. Michigan Geological and Biological Survey, Lansing, Michigan.
Paper on Poisonous Snakes, Kellogg. United States Biological Survey, Washington, D. C.

June

Motive: The Month When Nature Is Most Gay.

TOPIC 1—ROSES. X. Y. Z.

Activities

Let children bring roses, care for them in the room, make colored drawings, and carry some to the sick. They may be able to express the results of their rose study in an original game.

Purposes

To learn about roses that we may enjoy them more.
To discover as many kinds as possible.

The wild June rose representing wild roses.

The many garden roses; single and double; blooming once or all summer.

The Crimson Rambler, Dorothy Perkins, and other climbing varieties.

The hot-house roses, some of which are less hardy than others.

To learn how the blossoms grow; singly or in clusters; on bushes or vines.

To learn if all roses have thorns and where the thorns are found.

To learn why cut roses last longer when kept in a cool place with stems frequently clipped and the water changed daily.

To learn how rose leaves differ from other leaves. Do different roses have the same number of leaflets?

To dry the fallen rose petals for their fragrance in rose bowls.

To learn about rose-enemies, the rose bug and green aphids (lice) that live on the leaves. ("Black Leaf 40" purchased at drug stores is a good rose insecticide.)

Teacher's References:

Rose catalogs.
Selections by Melvin Hix. All Things Bright and Beautiful (Alexander).

TOPIC 2—BUTTERFLIES AND MOTHS. X. Y. Z.

Activities

White and sulphuric butterflies may be caught and kept alive in a wire cage. Include water, pieces of apple, and cabbage leaves. In the garden they lay their eggs on the cabbage plant. These hatch into the larvae, commonly known as the green cabbage worm. Early cabbage plants may afford the opportunity to find the larvae in all sizes from the recently hatched to those an inch long. Pupae may be found during the summer.

Problem: Shall we class these butterflies as friends or enemies?

Find the Mourning Cloak butterfly that appeared first in the spring. It is chocolate colored with a border of yellow about its wings.

Impress the distinguishing features of butterflies and moths. The latter have the feathery antennae and the former slender ones with hooks or knobs at the ends. The moth's body is usually large.

The children should have seen at least the Cecropia and Promethea moths develop in the rooms from their cocoons. These may be followed by the troublesome clothes moths seen flying about the home during spring and early summer. If caught and imprisoned in a jar with a piece of wool or fur, they may demonstrate what occurs in the clothes closet where they lay the eggs that develop into the larvae that are so destructive to garments.

A book of butterflies and moths can be started by the children and taken home for summer work when other kinds are found. They may

be encouraged to visit children's libraries for the purpose of studying books and pictures on this subject.

The Isabella Tiger-Moth that develops into the brown Woolly Bear caterpillar later may be discovered coming from the cocoon made from its own hair. The female begins to lay its eggs almost immediately and lives but a short time.

Teacher's References:

Downing, A Source Book of Biological Nature Study, pp. 85-96.
Comstock, Handbook, pp. 315-339.
Dickerson, Moths and Butterflies.

TOPIC 3—TREES: TREES SEEN DURING THIS SPRING (REVIEW). X. Y. Z.

New—The Catalpa.

Activities

The teacher is encouraged to invent devices for reviewing the different kinds of trees studied during the season, and to give a simple test on the same. Use pictures, drawings, specimens, and games of recognition.

Catalpa

If a tree grows in the vicinity of the school, the class should spend a period in observation.

Problems

To compare the Catalpa and Horse Chestnut as to flower clusters. (Do they develop before or after the leaves?)

Do the clusters grow from the ends or sides of the branches?

To watch during the summer for the developing fruits.

To compare the leaves in form and arrangement with the leaves of other trees. Press a few leaves.

To study the irregularities in the form of the tree.

Teacher's References:

Moseley, Trees, Stars and Birds.
Rogers, The Tree Book.
Mathews, Familiar Trees and Their Leaves.

TOPIC 4—BIRDS AND THEIR FAMILIES. X. Y. Z.

New—Crows and Hummingbirds.

Activities

Conduct some sort of a review of all the birds studied during the season by means of games, dramatization, or other methods.

Each child can take the part of a bird he wishes to represent and whose family life he can relate.

The Crow

Some of the children may have seen a scare-crow whose description will serve to introduce the crow and his habits. Is he entirely man's enemy? How intelligent has he proved himself to be as a pet?

How does the crow compare in size with other blackbirds? How and where do the crows build their nests? What is their usual call? Their danger cry? When danger is over they say, "Caw-aw, caw-aw, caw-aw."

Are they protected by law?

The Hummingbird

These birds are attracted by the many tubular and bellshaped flowers from which they obtain both nectar and insects. Learn about their interesting features and habits.

Literature for Children:

For the Children's Hour—"The Crow and the Fox," p. 107.
"The Crow and the Pitcher," p. 114.
The Outdoor Book—"What the Owl Said," p. 112. "Redwing at Home," p. 36.
In the Child's World—"The Scarecrow," p. 196. "About the Crow," p. 159. "The Comical Crow," p. 162.
Orchard and Meadow—"Why Old Mr. Crow Laughed," p. 31.

Teacher's References:

Comstock, Handbook of Nature Study, p. 120.
Moseley, Trees, Stars and Birds, p. 353.
Chapman, Handbook of Birds.
Job, How to Study Birds.

TOPIC 5—PLANTAIN, FLEABANE, AND DAISIES. X. Y.

Z. (Daisies only.)

Activities

Purposes: To stimulate the children to search for flowers everywhere in unpaved alleys, vacant lots, and fields.

To learn the names of a few weeds that flower in June.

To learn that they are encouraged to pick these flowers.

Plaintain

Both the broad and narrow-leaved varieties occur very commonly in lawns, gardens, and vacant lots. Each bears a spike of tiny green flowers that develop into what the children call "bird seeds." The class may be taken on a walk of discovery that should result in a col-

lection of several kinds of flowers gathered by each child. A committee may have the responsibility of pulling up enough plants to supply study material for each group or row of pupils with one or two specimens for the next lesson.

Problem: Why may we pick as many of these flowers and pull up as many of these plants as we wish?

Draw a leaf and a flower spike.

Fleabane

This plant is often incorrectly called a daisy, because the blossoms are somewhat daisy-like. The flowers are, however, much smaller, more delicate, and often purplish or rose colored. Taking all of the kinds of fleabane collectively they are nearly as common as dandelions. This statement may be verified or contradicted by the children after a search in vacant lots and lawns. The children should be able to recognize the fleabane plants not in bloom as easily as the dandelion plants.

Daisies (Ox-eye)

These may be called field daisies to distinguish them from the house plants, Marguerites, and the garden-cultivated Shasta daisies.

A few entire plants should be brought to the class room for examination. Compare the root-leaves and the stem-leaves. Find the new shoots with end buds ready to increase the plant.

Problem: Why should so beautiful a plant be called the farmer's enemy?

Each child should have a flower head to examine. They may liken the yellow center to the sun, and the white parts to the sun's rays and thus learn to call the latter ray-flowers. The name is literally "day's eye."

Paper daisies. White paper squares, five or six inches, may be folded diagonally as many times as possible, the broad end cut straight and shaped like a folded ray by cutting or tearing one edge. When opened, the rays may be further separated, if desirable. Let the children then decide how they can make them look more like daisies. (Color the centers in yellow.) When completed, they can be used for temporary decoration for the blackboard.

Literature for Children:

Meyer, Joe. Orchard and Summer—"From the Land of Summer," p. 141.
Sherman, Frank. Daisies.
Wadsworth, Oliver. Over in the Meadow.

Teacher's References:

Downing, Source Book of Biological Nature Study, Chapter VI.
Comstock, Handbook of Nature Study.
Brenchley, Weeds of Farm Land.

TOPIC 6—THE HOUSE FLY. X. Y. Z.

Activities

Problems

1. To learn why the fly is undesirable.
2. To learn how we can help to exterminate the fly.
3. To learn about the life of the fly.

Accumulation of data. Have the children watch for flies between two lessons and report on the number of places they are found and things on which they have been seen to alight. Look also for fly-specks. Study the behavior of a single fly while it is resting.

Collecting of flies for study. Use small fly traps or pieces of fly-paper on which they may be caught. Simple traps of tumblers and saucers may be devised and children may also catch them in their hands and place them under jelly glasses for study.

Some of the following features may be observed:

1. Two gauzy wings.
2. Two large eyes.
3. The stripes and hairs on the body.
4. Six hairy legs.
5. Pads on the feet, seen in enlarged pictures.

Add to the data accumulated the facts that flies lay their eggs in places like the garbage pail, the eggs hatch and become flies in two weeks. Why then should we kill as many flies as possible in the spring and early summer? How can children help to eliminate breeding places?

Our helpers in catching flies are certain birds, bats, frogs, and toads.

(X) If time permits the children can work in groups to model enlarged flies with toothpick legs and wax paper wings.

Make comparison of ants and flies in behavior and life history.

Other kinds of flies are fruit-flies, blow-flies, bot-flies and gad-flies.

Literature for Children:

Lovejoy, Nature and Verse—"The Spider and the Fly."
Craig, Nature Study Reader, Third Grade.

Teacher's References:

Hodge, Nature Study and Life, Chapter V.
Fabre, J. H., The Life of the Fly.
Sanderson and Jackson, Elementary Entomology.
Howard, L. O., House Flies, Farmer's Bulletin No. 459, U. S. Dept of Agriculture.
Smith, J. B., Our Insect Friends and Enemies, Chapter IX.
Herrick, Insects Injurious to the Household.
Eclectic Readers, Living Creatures, Among the Insects.

TOPIC 7—THE CRAYFISH. X. Y. Z.

Activities

The children spending week-ends in the country or living near the outskirts of the city can bring in "crabs," large and small, for the aquarium and terrarium. They are best transported in a jar with water plants.

For information and problems refer to references given below.

Teacher's References:

Comstock, Handbook, p. 466.
Downing, Source Book of Biological Nature Study, p. 16.

TOPIC 8—CIRCUS ANIMALS. X. Y. Z.

Activities

When well organized, this topic may be used as a project that will occupy at least a school week.

Use authentic books and pictures that will furnish correct ideas of form, color, and homes of the animals.

An entire table, sand table, or corner space on the floor, should be reserved where the unit of work may grow from day to day. Make self-expression on the part of the children the goal.

Materials that may be utilized. Sand, modeling clay, paint for coloring animals, sheets of heavy wrapping paper, any brown or black paper and newspaper, crayolas and other things that the children suggest.

They may wish to begin by setting up billboards advertising the animals that will appear at the circus. This will necessitate hand work for one group of children while another group may work on the circus grounds to plan for the comfort of the animals, another group may construct the animals. The co-operation should be such that each child will know the name and features of each animal included.

Literature for Children:

Eclectic Readers, Familiar Animals and Their Wild Kindred.
Ingersoll, Wild Neighbors.

Teacher's References:

Stone and Cram, American Animals.
Hornaday, Natural History.

Second Grade—A and B Classes

AIM: To aid the child to become further acquainted with his environment. To lead him to distinguish the useful and the destructive, and to protect the harmless and useful.

September

The Fruiting Season.

TOPIC 1—FLOWERS. X. Y.

Use flowers similar to those listed for Grade 1; also snapdragons, salvia, petunia, marigold, goldenrod, and aster.

Activities

1. Pupils and teacher should furnish the flowers.

Lesson: How to cut, arrange and care for flowers in the home and school. Let the children select a flower committee to care for all the flowers which they bring.

2. Learn the names of flowers and such distinctive features as the corolla, its color, and shape (the petunia—funnel shaped; the snapdragon—two closed lips; the salvia—two open lips; the sunflower and thistle—many tiny flowers in heads).

3. Hand work: Draw, or make paper flowers.

4. A committee may be responsible for the pressing of flowers for later use.

5. Learn to distinguish cultivated or garden plants, wild plants, and weeds.

Literature for Children:

Compton, The How and Why Library, Nature Volume.
A Wild Garden and Its Tenants.
Lovejoy, Poetry of the Seasons.
For the Children's Hour.
Little Brown Bowl.
Goldenrod and Aster.

Teacher's References:

Downing, A Source Book, Chapter VI.
Keeler, Our Garden Flowers.
Reed, Wild Flowers East of the Rockies.
Bailey, Lessons With Plants, pp. 72, 182.
Coulter, Elementary Botany.
Weed, Farm Friends and Foes.

TOPIC 2—WEEDS. X. Y. Z.

Butter and eggs, thistle, dock, pusley or purslane, tumble weed, and others.

Activities

Weeds, sometimes beautiful but mostly troublesome. Why troublesome?

Possible project: Help eliminate the weeds about the home and school. (Destroy.) Include a weed recognition contest.

Literature for Children:

Nature in Verse—"What the Burdock Was Good For."
M. L. Warren—"From September to June," Lesson 7.

Teacher's References:

Trafton, The Teaching of Science, Chapter XIII.
Beal, Michigan Weeds.
Downing, Biological Laboratory Guide.

TOPIC 3—FLOWER HELPER. X. Y.

Butterflies, bees, humming birds, sphinx moths.

Activities

1. Butterflies: Swallor tail, monarch, and others. Have specimens and study their life history. (They may be caught with an insect net.)
2. Bees: Honey, and bumblebees—preparing honey for themselves and man.
3. Handwork: Build a paper bee hive. Show a box of commercial honey in the comb. Demonstration—box of bees at work under glass.
4. Humming Birds: Study pictures. Note the size, beak, and flight, as special advantages in flower pollination.
5. Moths: Tomato worms may yet be found in gardens and can be fed on tomato leaves until the pupating period occurs. (They develop into the sphinx moth that visits petunias and like flowers at dusk.)

Literature for Children:

Lovejoy, Nature in Verse—"The Song of the Bee." "The Busy Bee."
John Burroughs, Birds and Bees.
For the Children's Hour—"Cupid and Psyche."
Jenkins, Interesting Neighbors.

Teacher's References:

Holland, Butterfly Guide (Pocket Manual.)
Downing, Source Book, pp. 86-96, 103-111.
Comstock, Insect Life, p. 285.
Dickerson, Butterflies and Moths.
Holland, Moth Book.
Nature Study, Detroit Schools, June, 1912, pp. 55-58.

TOPIC 4—SEEDS AND SEED COLLECTING. X. Y. Z.

Poppy, petunia, zinnia, etc., radish, lettuce, etc.

Activities

1. Seeds: Many go to waste that the children can help to save. From available gardens bring in flower and vegetable seeds, sort them into labelled cups; then prepare paper packets.
2. These packets can be decorated, filled, and saved for Christmas gifts or kept for spring planting.

Teacher's References:
Seed Catalogs.

TOPIC 5—HORSE CHESTNUT, SWEET CHESTNUT. X. Y.

Activities

1. Combine the study of the horse chestnut and edible chestnut for the purpose of comparison. Both have the bur, but that on the sweet chestnut covers the nut-fruit, while the horse chestnut bur holds the seeds and is the fruit itself.
2. Collect horse chestnut seeds to grow in the spring. (Include the study of these trees.)

Literature for Children:
Horace Mann's Second Reader—"The Chestnut Bur."

Teacher's References:
Hough, Trees of Northeast United States.
Rogers, Tree Book.
Rogers, Trees Every Child Should Know.
Keeler, Our Native Trees.
Keeler, Our Native Shrubs.

TOPIC 6—AUTUMN COLORS. X. Y.

Trees and shrubs.

Activities

Follow suggestions for trees and shrubs in the first grade outline.

Problems

1. To learn what trees and shrubs change color first.
2. To record the date of such changes.
3. To determine whether frost hastens changes in color.
4. To continue collecting and pressing colored leaves through October.

TOPIC 7—PLANTS FOR SCHOOL DECORATION. X. Y. Z.

Activities

Indoor plants: Watch for opportunities to obtain from porch boxes any material in the neighborhood that might otherwise freeze.

Teacher's References:

George, The Primary Plan Book, Autumn, pp. 100-101.
Trafton, The Teaching of Science, p. 128.

TOPIC 8—INSECTS—INJURIOUS AND USEFUL. X. Y. Z.

Grasshoppers, crickets, caterpillars, silk worms, dragon flies, potato beetle, lady bird beetle.

Activities

1. Insects may be collected and brought to the school in candy boxes with perforated covers, or in fruit jars, with plenty of fresh grass for food.

2. The class should be taken for a trip in the neighborhood to study grasshoppers and crickets.

Problems

1. Do they hop, fly or walk?
2. How far at a time?
3. Do all grasshoppers have large wings?
4. Does their coloring protect them?

3. Gather as many kinds of insects as possible and keep each kind in a separate jar or cage. Feed them liberally with fresh grass.

4. Keep a record of the children's questions on these insects.

5. Compare potato and lady bugs as to general features and destructive habits.

6. Silkworm eggs may be hatched and carried through to the cocoon stage, if started early. Allow at least four weeks before mulberry leaves fall. The worms may be kept in a box cover but must be fed several times each day. Break up the leaves at first until the worms are a half inch long. Leave no moisture on the leaves.

Literature for Children:

Stepping Stones, Second Reader—"The Ant and the Grasshopper."
Harrison, In Story Land.
"Story of Small Green Caterpillar and Beautiful White Butterfly."
Faber, Insect Stories.
Familiar Animal Tales.
"Grasshopper Gay."
For the Children's Hour.

Bud and Bamboo.
Schwartz, Grasshopper Green Garden.

Teacher's References:

Sanderson and Jackson, Elementary Entomology.
Belding, Michigan, Silk Worm Products.
Month by Month, pp. 39-50.
Kane, Injurious Insects.
Smith, J. B., Our Insect Friends and Enemies.
Downing, A Source Book, p. 77.

TOPIC 9—FRUITS. X. Y. Z.

Plum, quince, several kinds of grapes, bittersweet, mountain ash, etc.; poison ivy berries, poison sumac berries.

Activities

1. So far as possible have a few branches with leaves and the fruit.
2. Locate and study fruit trees in the neighborhood.
3. Associate the leaves and fruit.
4. Make comparison of the peach and plum (stone and fruit), both externally and internally; also the pear, quince, and mountain ash.
5. Find seed-pockets in each, and save the seeds.
6. If properly planned, the edible fruits may be used for lunch in the course of the study.
7. Compare the means of protecting seeds in the quince, the papery core plum; the stone and grape, hard coat.

All fleshy fruits are not edible, e.g., the poison ivy with its white berries:

"Leaflets three, quickly flee:
Berries white, dread the sight."

TOPIC 10—FOOD FROM THE GARDENS. X. Y. Z.

Potatoes, turnips, cabbage, chard or celery, cucumbers or melons, beans and others.

Activities

1. Vegetables: At least one whole plant of each kind should be brought direct from the garden. Children also should see them growing if possible, in a school or private garden.

Questions

1. How can we recognize each plant?
2. Why are only certain parts of each plant eaten?
3. What plant organs are edible in each?

2. Classify them under the names: "earth," "leaf and stem," and "fruit vegetables."

Questions

A. How important are vegetables in our diet?
B. Which vegetables are best when cooked?
C. Prices?

3. Handwork: Cut out pictures of each kind from seed catalogs or make colored drawings for vegetable booklets. Utilize the child's interest in the school garden or State Fair exhibits or open markets in the vicinity.

Teacher's References:

Downing, A Source Book, p. 247.
Bulletin, U. S. Dept. of Agriculture, "Thirty Poison Plants."
Sargent, Plants and Their Uses.
Coulter, Elementary Botany, Part 2.
Seed Catalogs.

TOPIC 11—BIRDS: PREPARATION FOR MIGRATION. X. Y. Z.

Song sparrow, bobolink, swallow, oriole.

Activities

1. Stimulate the observation of birds until it becomes a habit.
2. Fall interest: Flocking, change of plumage, stopping en route for food.
3. Review summer birds studied during spring term.
4. Leave the general subject of migration until November. A few bird nests can be brought in for a school collection.
5. Handwork: Make paper cuttings of some one kind of bird and paste them on the corner of the blackboard as a reminder of birds in flight.

Literature for Children:

Lovejoy, Nature and Verse, pp. 223-4.
Story Hour, Second Reader—"Who Stole the Bird's Nest?"

Teacher's References:

Chapman, Travels of Birds.
Downing, Biological Laboratory Guide.

TOPIC 12—STOCKING THE AQUARIUM.

Activities

1. A balanced aquarium. While running water makes the best aquarium such as the one at Belle Isle, anyone may have a balanced aquarium by stocking it with green water, plants, and animals. Rain

water caught opportunely, is better than tap water. Children may help in bringing sand and gravel, water animals, and plants, in Mason jars.

2. During the winter months goldfish may be added for renewed interest.

Teacher's References:

Otto Eggeling, The Fresh Water Aquarium and Its Inhabitants.
Comstock, Handbook of N. S., p. 380.
Hodge, Nature Study and Life.
Hart, Inez, Aquariums and Terrarium (paper included.)

TOPIC 13—WEATHER CHART. X. Y.

Dew, rain, and rain clouds.

Activities

1. Children may keep their own calendars and record nature happenings that especially interest them.

2. Make a special point of sun study when the sun sets due west, and days and nights are equal in length. (September 21.)

3. Place a smoked glass in a convenient place where children may look at the sun.

4. Copy a clock disk and mark the shadows made by a long pin placed at its center. Mark the position of the shadows during each class hour of the day. This may lead to a project "telling time" or "the sun's travels."

Literature for Children:

The Merrill Second Reader—"The Rain."
Gordon Third Reader—"The Dewdrop."
Lovejoy, Nature and Verse.
The Setting Sun.
At Sunset.

Teacher's References:

Month by Month.
The Primary Plan Book.
Rogers, Earth and Sky Every Child Should Know.

Aquarium

In making an aquarium, *imitate nature.*

Four important considerations are:

1. The equilibrium between plant and animal life.

Animals do not thrive where plants are not growing.

The plants have three functions:

a. To supply food to herbivorous creatures.
b. To supply oxygen to animals.
c. To use the poisonous carbonic acid gas given off by animals.

2. Ventilation.

All animals need air. They get it from the water which contains air, from

the water plants, and from the open surfaces of water. (A fish or a tadpole cannot live in a long-necked bottle.) If a fish stays with its mouth at the surface and body hanging down, it is being suffocated. Never allow scum on water—it shuts off oxygen and means death. Skim it off or change the water.

3. Temperature.

This should be between 40° and 50° Fahrenheit and the aquarium should be protected from the bright sunlight.

4. Choice of animal life.

Use in still water, animals which live in still water, and in running water, those found in swift streams.

Do not overstock. It is better to have too few plants and animals than too many.

If a green slime forms, the ponds should be put in a shadier place. Snails will help clear it up. If everything is properly balanced so that the plants keep the water fresh and the animals keep the plants from multiplying too rapidly, the water need not be changed. Add water enough to make up for evaporation. Rain water is best.

Dead insects and dead plant matter may be removed with a medicine dropper or long glass tube. Dust may be removed (skimmed off the top) by laying pieces of blotting paper on the surface for a moment.

Charcoal serves if a deodorizer or disinfectant is needed.

For class talks and other special studies, specimens may be removed to temporary aquaria—such as glass tumblers, small fruit jars, or any wide mouthed dish.

In the permanent aquarium put in a three-inch layer of clean sand. Add water plants and anchor them down with stones. Pour water (from the pond if possible) in very carefully—a rubber tube siphon is very good to use. In the course of a few days the plants will be giving up oxygen and supplying the carbon dioxide. The best plants to use are the Cabomba, water milfoil hornwart, bladderwort, water buttercups, ditch moss, eel grass, pond weed, all of which are flowering and have long slender thin leaves or leaves so cut that their parts are threadlike.

The balanced aquarium should be stocked with plenty of water plants and a few animals.

Combinations for animal life in one aquarium:

I. A couple of minnows, two or three dragon fly nymphths, and a couple of snails.
II. Tadpoles and snails.
III. A few very small fish with water snails and fresh water clams.
IV. Medium sized cray fish and small water turtles. Be sure to furnish something upon which turtles can climb out of the water to breathe and sun themselves.
VI. Insects.

Many insects—both those that spend their entire lives in the water and those that are aquatic during only one stage.

Some of these are:

Predaceous diving beetle.
Water tiger.
Water scavenger beetle.
Water boatman.
Back swimmer.

Giant water bug.
Water scorpion.
Dragon fly.
Mosquitoes.

Food for animal life. (Never leave an excess in the tank.)

Water snails. Bits of lettuce or cabbage, unless there is some green slime for them to feed upon.

Land snails and slugs. (Keep on wet sand.) Cabbage and lettuce leaves.

Fish. Crushed vermicelli, snail eggs, fish food, bread crumbs.

Minnows. Worms, bits of fresh meat, flies and other insects.

Crayfish. Snail and water insects.

Terrarium

Use about three or four inches of soil in the bottom, sink a pan of water at one end. Cover soil with moss kept very wet. Small ferns, partridge berries, or wintergreen berries may be added. Part of the space may be covered with small pebbles for animals to sun themselves on. Cover with glass as wood plants soon dry out. Stock.

1. Turtles and crayfish.
11. Toad and garden snails.
III. Young garden snakes.
IV. Red salamanders.

Food:

Turtles—earth worms and raw meat.

Toads—caterpillars, earth worms and raw meat.

Snails—fresh leaves—as lettuce, etc.

Put salamander or frog eggs in a flat white dish with just enough clean, cool water to cover them until the tadpoles hatch out. When large enough, transfer some to permanent aquariums. Vegetable diet for polliwogs.

Teacher's References:

Teacher's Cornall Leaflet, No. 11, April, 1898.
Detroit Third Grade Nature Outline, Sept., 1914.
Cornell Rural School Leaflet, Sept., 1920.
Detroit Supplementary Nat. St. Outline, 1913.
Comstock, Handbook of Nature Study.

October

The Month of Travel

TOPIC 1—BIRDS IN FLIGHT. X. Y.

Activities

1. After dwelling on the cardinal points relative to the school building, home, and city, let the children report on direction taken by flocks of birds. Let the children also study about wild ducks or geese. Tame ducks may be used as the center of interest. Schools in certain localities may plan to have a live duck brought in for study.
2. Compare the duck's three means of locomotion. Make paper cuttings of its legs and wings.
3. Stress the duck's plumage, how it protects yet helps in flight.
4. Study feathers in general. Have as many kinds of feathers as possible, body, wing, and tail feathers. Emphasize their uses to bird and man. Protection of birds that would be shot for ornamental feathers. Jack Miner's farm, bird reserves. Differences between wild and tame ducks and geese.

Literature for Children:

Lovejoy, Nature in Verse—"The Points of the Compass." "The Wanderings of the Birds."
For the Children's Hour—"The Ugly Duckling."

Teacher's References:

Chapman, Travels of Birds.
Comstock, Handbook of Nature Study, pp. 27-40.
Museum Specimens.
Blanchan, Nature Neighbors, Vol. 1.
National Geography Magazine, Game Birds, 1921.
Reed, Water Birds.

TOPIC 2—TRAVELS OF SEEDS. X. Y.

Activities

1. Spend a class hour in a vacant lot or weed patch. Collect many seeds and fruits with special devices for dispersal, such as wings, tufts of hair, hooks, barbs. Another hour may be spent in sorting and mounting them in books or on cards. Group the seeds according to their means of travel.

Literature for Children:
The Outdoor Book—"How the Burrs Traveled," p. 80.

Teacher's References:
Beal, Seeds of Michigan Weeds.
Gibson, Hamilton—"Sharp Eyes," "Secrets Out of Doors," and "Eye Spy." (Illustrations.)

TOPIC 3—LEAF DEPARTURE. X. Y. Z.

Activities

1. Trees make ready for leaf departure. Bring in a few branches still bearing leaves. Test the ease with which the leaves are detached. Find the "cork stopper" on branch (scar). Why is it necessary? What has become of the sap?

2. Have the children help in collecting an abundance of leaves of various colors. Sort them into piles according to colors—brown, red, yellow. Press some of the best in magazines to be used later. Let the children devise uses.

3. Where do leaves travel? In a park or under a group of several kinds of trees let the children search among fallen leaves. Purpose: To see if all leaves are from trees under which they are found. Tell the uses of dead leaves. (Recall leaves in the woods.) How can they help our gardens?

Literature for Children:
Nature in Verse—"How the Leaves Came Down."
For the Children's Hour—"The Anxious Leaf."

Teacher's References:
Downing, A Source Book, pp. 313-345.

TOPIC 4—BULB PLANTING. X. Y. Z.

Activities

1. Lesson: Bulbs (baby plants in heavy wrappings). Plants in pots for indoor forcing for school and home, (daffodils and hyacinths). Let the children bring bulbs and pots for home culture. Leave the bulbs in the cold and dark 6 or 8 weeks before bringing them to light. Plant crocus bulbs around shrubbery and in the grass. Use a sharpened broom handle for making holes.

Teacher's References:
Bulb catalogs.

TOPIC 5—FLOWERS OF THE MONTH. X. Y. Z.

Chrysanthemum, asters, witch-hazel.

Activities

1. Learn to know each kind. Use them for room decoration. In regions of plenty, collect and send them to museums for other schools. Send some to the sick. For handwork make paper chrysanthemums.
2. Witch-hazel from the woods bears fresh flowers and fruits from last year's bloom. Note the plan of four in the flowers. Save branches until the fruits snap the seed. (Medicinal parts.)

Teacher's References:

Comstock, Handbook, pp. 558-810.

TOPIC 6—INSECTS IN WINTER HOMES. X.

Lead-rollers, gall-dwellers, wasps and their houses.

Activities

1. Galls—willow and golden-rod. Clean out insect cages and gather cocoons during October and November. Open a few galls to find larval insect.
2. Wasps' nests of mud or paper may be available through children's efforts or from the Museum. A clay modelling lesson can be given to make models of the mud-dauber home. (Comstock, Hand Book, pp. 429-430.)
3. After telling stories of the wasp and other insect life—both injurious and useful—let the children write riddles. Save the best as samples for another class.

Literature for Children:

Fabre, The Story Book of Science, p. 126.

Teacher's References:

McCook, Nature's Craftsman.
Trafton, The Teaching of Science, p. 75.
Patch. A Little Gateway to Science.
Comstock, Ways of the Six-footed.
Comstock, Handbook, pp. 357-364, 767.
Downing, A Source Book, pp. 111-113.
George, The Primary Plan Book, pp. 102-105.

TOPIC 7—SPIDER-WEBS AND NESTS. X.

Activities

1. Look for web-building spiders in and about the school. If kept in a large glass jar or cage they often continue their work.

A. Children's Problems: To learn if spiders are our friends or enemies. Should we fear them? How is the web built? What is the purpose of the web? Could you draw so accurate a web? Try it.

B. Teacher's Problem: To discover the amount and type of children's interest in spiders. If keen, continue to hunt different types, such as grandfather greybeard, the orb, funnel, and balloon builders.

2. Compare with poisonous spiders, such as tarantulas. Why can we not call spiders true insects? (Compare the number of legs.)

Literature for Children:

Kellogg, Insect Stories.
Alice J. Patterson, The Spinner Family.
Craig, Nature Study Reader, Third Grade.
Fabre, Story Book Science.
For the Children's Hour—"Mother Spider."
Lovejoy, Nature in Verse—"The Shining Web." "The Spider and the Fly."

Teacher's References:

Nature Study Review, Vol. 15, November; Vol. 17, February.
Comstock, Handbook, pp. 472-488.
Nature Study Review, March, 1921.
Comstock, The Spider Book.
Hodge and Dawson, Civic Biology, p. 163.

TOPIC 8—THE FLY. X. Y. Z.

Activities

Why are flies so abundant in the fall? Do we want the fly to use our house as his winter home? Shall we continue to swat the fly?

Teacher's References:

Howard, L. O., Housefly, Disease Carrier.
Farmer's Bulletin 459.

TOPIC 9—NUTTING PARTY AND HALLOWE'EN. X. Y. Z.

Activities

1. Enlarge on the first grade plan.
2. Possible project: Gathering of materials for Hallowe'en celebration.
3. Problems:

A. To learn where pumpkins, corn, and nuts are growing and how they may be secured.

B. To learn about some of our native nut trees, (walnut, butternut, hickory, and beech).

C. To learn about corn and pumpkins in the field.

D. To decorate and plan the celebration.

E. To make the best uses of materials after the celebration. (This activity may necessitate the co-operation of the literature and art teachers.)

Literature for Children:

Nature in Verse—"The Gossip of the Nuts." "Little Nut People."
For the Children's Hour—"A Great Surprise." "The Story of the First Corn."

Teacher's References:

Otis, Michigan Trees.

TOPIC 10—WEATHER CALENDAR. X. Y.

Activities

1. Stress the study of sunshine and frost. Compare the total days of sunshine in October with those in November and December. Compare the frosty nights of this month. Notice frost on the roofs in early morning.

2. Relation of sun and frost,—their effects on vegetation.

Literature for Children:

For the Children's Hour—"The Story of the First Corn."

TOPIC 11—STARS—CONSTELLATIONS. X.

Great Bear, Little Bear, Cassiopeia; significance of North or Pole Star.

Activities

1. Associate the great and little dipper with the Great and Little Bear by board drawings which the children may copy.

A dipper may be used to show the location of the stars forming the Big Dipper. Children can cut out paper stars and paste them on a chart or the blackboard to form the dipper.

Literature for Children:

The Elson Reader, Book II.—"The Star Dipper."

November

Motive: Preparations for winter made complete.—Thanksgiving.

TOPIC 1—ANIMALS THAT HIBERNATE. X. Y. Z.

Beaver, gopher, bear, and others.

Activities

General Problem: To learn how some of the animals get ready for winter.

1. Beaver: One of the great examples of industry or self protection.
   - A. To learn about the beaver from different sources.
   - B. To construct a model of a beaver-dam.
   - C. To learn how the bear winters.
   - D. To compare the beaver, gopher, and bear homes.
2. The Teacher's Problem: To test the interest of the children in animal activities. Do they prefer carnivorous or herbiverous animals?
3. Make use of Museum specimens and pictures. (State Fair live beaver exhibit may be recalled.)

Teacher's References:

National Geographic Magazine (animal numbers.)
Stone and Cram, American Animals.
Our Wonder World.
Sharp, Dallas Lore, Wild Life Near Home.
Rogers, Julia E., Wild Animals Every Child Should Know.
Cornish, C. J., Animals at Work and Play.
Downing, A Source Book, pp. 204-206; 168-175; 182.
Bigham, Merry Animal Tales.

TOPIC 2—THE LAST BIRDS TO MIGRATE. X. Y. Z.

New arrivals: Our Winter birds, chick-a-dee, junco, crow, etc.
Attracting birds about our homes.

Activities

1. Enumerate birds that have gone south by showing pictures of birds. Have museum specimens of winter birds. Learn the markings and calls of the chick-a-dee, junco, etc.
2. Problem: To attract birds about the school and home.
3. Construct paper patterns of feeding stations and bird shelters.

(Have the Manual Training Department co-operate.) Fasten bells on pet cats.

4. Clean out and close up bird houses.

Literature for Children:

Patch, Edith M., Little Gateways to Science.
Book II, Bird Stories.
Lovejoy, Nature in Verse, p. 223; pp. 272-274.
Baldwin's Third Reader, Silver Hair and the Three Bears, p. 225.

Teacher's References:

Chapman, Winter Birds.

TOPIC 3—TREES. X. Y.

Activities

1. Have several kinds of tree branches in water.

Problem 1: To discover how the tree has prepared for its rest.

A. Bark on trunk and branches.

B. Bud coverings, etc.

C. Fallen leaves make blanket.

Problem 2: To recognize trees in their winter condition. (Make drawings.)

2. Utilize all pressed leaves for leaf books and recognition tests. Draw designs of bare trees on the board and test the child's power to attach the proper leaves.

TOPIC 4—SHRUBS AND VINES. X.

Activities

1. To distinguish between trees, shrubs, vines.

2. Have shrubs and vines lost their leaves? Look at hedges, honey suckle bush and vine, Boston ivy on buildings.

TOPIC 5—PREPARATION FOR WINTER IN OUR HOME. X. Y. Z.

Activities

Possible projects:

A. Comparison of our winter home with that of the Indians, including shelter, food, and clothing.

B. Exhibition of native's gifts for which we are thankful.

C. Originate and illustrate a story that might be told by the flour and its cereal relatives. (From field to the home.)

Literature for Children:

Dopp, The Early Cave Men.
The Cave Twins.

Teacher's References:

Craig, Teacher's Manual of Nature Study.
Starr, American Indians.
Eastman, Indian Scout Talks, Chapters IX and X.
Judd, Wigwam Stories.
A. Flanagan Co., Plan Book.
A. Flanagan Co., Year Book.
F. A. Oliver Co., Everyday Plans.
Course of Study in English, Grade 1A.

December

Motive: Winter and Service.

TOPIC 1—SEASONS AND MONTHS.

Activities

Enlarge upon Grade 1 activity by drawing two circles like the rim of a wheel and twelve radii for spokes. Color between the spokes for the months. The children may select their own colors. The following are appropriate colors of the spectrum: blue for January, blue-green for February, green for March, yellow-green for April, yellow for May, yellow-orange for June, orange for July, red-orange for August, red for September, red-violet for October, purple for November, blue-violet for December. The rim of the wheel may be colored for the four seasons. Use the design for some gift as a calendar cover.

Literature for Children:

Poulsson, In the Child's World.
Strong, All the-year-round.
The Posy Ring.
Aldrich, Marjorie's Almanac.
Compton, The How and Why Library, pp. 364-365.

Teacher's References:

Hodgdon, Junior General Science, p. 273.
Children's Museum. Picture matching games.

TOPIC 2—DAYS OF THE MONTH AND THE WEEK. X.

Activities

1. Let the children learn the rhymn: Thirty days has September, April, June and November, etc.

2. A calendar game: Twelve children may be selected as month captains. Each captain should call out a regiment of pupils numbered according to the days of his month and the days of the week, as follows: John is Tuesday, the 12th; Mary is Friday, the 15th. A pupil may serve in different regiments, but each captain should have his written list to save time in calling. The point of the game is a time contest. The captain who can most quickly assemble his regiment with pupils in their proper places according to the days and weeks of his particular month is the winner. A large calendar should be hung on the board for a guide.

TOPIC 3—TELLING TIME OF DAY. X. Y.

Activities

1. After making observations similar to those given in Topic 2, Grade 1, the children can locate the position of the sun at noon and conclude that the sun is the first guide to time calculation.

2. Since the home and school must be run on a time schedule, mothers and children must have a convenient device by which to quickly tell the minutes and hours, consequently, we depend on the clock. Children may learn to read the clock. Suggestion: Have a clock in the room. Use the twelve-spoked wheel design for the clock face and add numbers and hands. The hands may indicate the time when the class meets, meal-time, bed-time, opening or closing of school, etc.

3. If desirable, the clock face may be made a paper cutting and folding exercise, as follows: Fold square papers into triangles, the triangles into thirds, then sixths. Cut off the points, open and add figures on the creases and hands running from the center. Practice on pieces of newspaper.

4. Let the calendar game and the clock study lead to watching for the shortest day in the year (December 23), the time when the sun is farthest south, giving us cold weather.

Literature for Children:

Bailey, For the Children's Hour. The Living Alarm Clock.
Poulsson, In the Child's World. What the Clock Told Polly.
Compton, How and Why Library, pp. 323-328.

Teacher's References:

Comstock, Handbook of Nature Study, p. 913.
Hodgdon, Junior General Science, p. 263.

TOPIC 4—WEATHER IN DECEMBER. X.

Activities

Repeat Grade 1 activities for the same topic.
Why is the sky blue?
Why is the sky many colored at sunset?

Teacher's References:

Compton, How and Why Library, pp. 379-380.

TOPIC 5—SKY STUDY, TAURUS (THE BULL) AND THE PLEIADES. X.

Activities

Let the teacher draw on the board the five stars of the head of the Bull with the bright star, Aldebaran, at one end of the V; also the several stars of the Pleiades in the same vicinity east of the zenith. Read about the Seven Sisters in the Pleiades.

Literature for Children:

Jane Andrews, Seven Little Sisters.
Gertrude C. Warner, Star Stories for Little Folks.

Teacher's References:

Moseley, Trees, Stars and Birds.
Children's Museum, Pictures of the Heavens in Winter.

TOPIC 6—ANIMALS THAT SERVE MAN. (BEASTS OF BURDEN.) X. Y. Z.

Horse, reindeer and camel.

Activities

1. Follow the plan of activities suggested in Topic 5, Grade 1, and develop the idea that each animal renders its service to man in its native environment due to its adaptation to certain climatic conditions.

Use stereoscopes and stereographs to be obtained from the Children's Museum.

Literature for Children:

Pyle, Katherine, Stories of Humble Friends. (Firefly.)
Elm Reader, Book III., Old Horses Know Best.

Teacher's References:

Downing, Laboratory Guide in Biological Nature Study, pp. 56-66.
Keystone View Company, Visual Education Teacher's Guide to Primary Set, Transportation, pp. 64-67; pp. 96-110.
Burkett, C. W., Domesticated Animals.
Cornish, C. J., Animals at Work and Play.
Fabre, Jean-Henri, Our Humble Helpers, The Domesticated Animals.
Seton, Ernest Thompson, Animal Heroes.

Eddy, Sarah, Friends and Helpers.
Thomas, Anna, First School Year, p. 86 (T. C. Library.)

TOPIC 7—ANIMALS THAT COME TO MARKET FOR OUR CHRISTMAS DINNER. X. Y. Z.

Activities

Let the children, with the teacher's assistance, work out some form of a project suggested by this topic. Find stories and poems in readers and school and home libraries.

This should relate the chicken, duck, turkey and goose. Use the collection of feathers for drawing, recognition of their service (covering, flight, etc.); fowls from which they came.

Let discussion lead to some problem concerning the partly domesticated pigeon that will be studied in January, such as: How can we attract the pigeons about the school as they gather in Grand Circus Park? Suggest that parents take their children to the park to study the pigeons there.

Teacher's References:

Shaler, Domesticated Animals, p. 152.
Farm Life Readers, Books 3 and 5.
Smith, E. Boyd, The Farm Book.

TOPIC 8—FRUIT FOR CHRISTMAS. BANANAS. X. Y.

Activities

1. Secure pictures of the banana tree in fruit. Ask the children to notice how the bunches of bananas are suspended in the store. Do they hang thus on the tree? An old stem from which the bananas have been removed may be secured from a grocery or fruit store to note its length and strength, the whorled arrangement of the fruit, the position of the oldest and youngest. Recall the banana tree seen in the city conservatory.
2. Make drawings of the exterior and sections of the fruit. Compare oranges and bananas as to form, covering, and interior.
3. Review the first grade study of the orange. Discuss climatic conditions that prevent the growing of oranges in Michigan.
4. Refer to Children's Museum for pictures.

TOPIC 9—THE CHRISTMAS TREE. X. Y. Z.

Activities

X. Y. 1. Why select the Spruce or Balsam as best suited for a

Christmas tree?

Have branches of different Pine trees as White and Austrian Pine, Spruce, Balsam, Arbor Vitae, and Cedar. Place them in the sand table or window box and study them as to the following:

a. Character of the leaves: long or short needles or scales; their smoothness and toughness; their arrangement on the branch; the evergreen as compared with other trees.

b. Straightness of the branches and their possibilities for holding gifts.

c. Shape of the entire tree.

X. 2. Pine cones.

a. Soak a few cones of Spruce, Pine, and any other available varieties to close the scales. Note the symmetry of arrangement of the scales that may be shown in drawings by two sets of diagonal lines that cross one another in an oval the size of the cone. Each block will represent a scale that can be correctly shaped if desired.

b. Allow the cones to dry and open. Locate the seeds, estimate the number of seeds in one cone. Toss up a few seeds and test their possibilities in seed-dispersal.

Z. 3. Pine tree shapes may be cut from green paper and used for decorations or drawings may be made in colors.

Literature for Children:

Bailey, For the Children's Hour—"How the Fir Tree Became the Christmas Tree." "The Pine Tree."
Wiggin, K. D. The Posy King. The Christmas Trees.
Wiggin, K. D. The Posy King. The Christmas Holly.

Teacher's References:

Otis, Michigan Trees.
Rogers, Tree Book.
Our Wonder Book, Vol. III., pp. 390-398.
Blakeslee and Jarvis, Trees in Their Winter Condition.
Children's Museum, Pictures and Branches.

January

Motive: Cold weather interests.

TOPIC 1—NATURAL FORCES DEMONSTRATED BY MECHANICAL TOYS. X. Y.

1. See Grade 1—Directions.
2. Water buoyancy and water as motor power.

Activities

1. The teacher can provide a dish of water and demonstrate the floating possibility of the celluloid duck and Chinese wood flowers. Have at hand also several objects of varying weights which one child may test until he and the other children have concluded that weight is the determining feature. Let them suggest the toys among their Christmas gifts that demonstrate the use of the buoyancy of water. If they have none they can bring to school they may think of substances, such as cork, light wood, out of which they can make floating toys. Let them compare floating toys with the toy balloon.

2. A water wheel may be made by an older boy (directions given in Downing's Physical Nature Guide, p. 65), or some toy may be furnished to illustrate water power. Compare with this, the wind mill.

3. Any toys may be bought, provided they demonstrate some natural law and serve the purpose of impressing the fact that we are using nature's gifts in play as in work.

TOPIC 2—WINTER FORMS OF WATER AND ASSOCIATED PHENOMENA. X. Y.

1. Rain and snow in the air.
2. Frost, snow, and solid ice.
3. Freezing and melting.
4. Weight of ice.
5. Evaporation and cloud formation.
6. General meaning of clouds.

Activities

1. If rain occurs during the month, note:
   a. The temperature.
   b. Rain clouds.
   c. Water running into sewers.
   d. Part evaporated by sun and wind.

Perform the following simple experiment to prove (d): Fill a glass tumbler one-third full of water, cover with a piece of glass, and leave for at least twenty-four hours to note the formation of water drops. This can lead to the discussion of clouds and fog in water, vapor condenses on cold dust particles in cold air.

2. Collect and hang on the wall as many pictures of clouds as possible that the children may watch the variations in clouds and compare them with the pictures.

3. a. When it is snowing, read thermometer and compare temperature with that ascertained during a rain storm.

b. Place a dark cloth or paper on the outer window sill where the children can study the forms of snow flakes. Suggest also that they study the flakes that fall on their coats while out of doors.

c. Cut out flakes from paper according to the following directions and compare with the real flakes: Fold a four-inch square of paper (tissue paper is best) diagonally twice, then again into thirds by crossing the two points. Cut broad end diagonally to make a sharp point against the folded side. Make many rather deep notches on the outer edge and diagonal end, also a few shallow notches on the folded edge. Open and see if you have a six pointed snow flake. Can you find as many varieties of snow flakes as the various ones made by the children?

The best flakes can be selected and mounted on dark paper for a decorative border above the blackboard.

4. Freezing and thawing. (Advise the children to try these experiments at home to check off the school results.)

a. Secure two like tin cans with covers (baking powder, coffee, or soup cans), also two old pickle bottles or fruit jars with corks or covers. Fill all even full of water and place one of each kind on the outer window sill, and others on the inside, on a very cold day. Leave till the outside ones have frozen solid. What happens and why? Stimulate the children to ask questions and to answer their own questions.

b. Pack snow balls as hard as possible, pour water over them and leave till they have become ice. Place the ice ball in a dish of water to determine whether it will float or sink. Compare with the balloon, soap bubble, and floating toys in Topic 1.

c. Let a group of children construct a snow man in the school

grounds where it may be seen from the window. Note the date on which it is built and compare its duration with that of the snow on the ground. Stimulate questions and answers.

d. Let the ice in the cans melt, and watch the process. Where does melting begin? Did freezing begin in the same place?

e. Pack a glass tumbler full of snow and place where the snow will melt. Does the water occupy the same amount of space? Why? Is the water clear? Did you secure the cleanest snow possible? What forms the center of every snow flake? (a dust particle).

Assemble and review all facts gained from these experiments.

Literature for Children and Teacher's References: See Topic 3.

TOPIC 3—WATER AND HEALTH. X. Y. Z.

Activities

Let the children form groups, each of which may dramatize one phase of the subject for the benefit of the rest.

1. Uses of water for cooking and drinking.
2. Cleanliness—bathing, washing of clothes, cleaning of houses.
3. Care of gardens and lawns.
4. Sprinkling and cleaning of city streets.
5. Heating of houses and extinguishing fires.
6. Summary of the number of times and ways in which one individual should use water to keep well.

Literature for Children:

Poulsson, Child's World.
- To Whom Shall We Give Thanks?
- Story of the Snowflakes.
- Water.
- The Story of the Morning Glory Seed.

Bailey, For the Children's Hour.
- What Broke the China Pitcher?
- The Snowman.
- Grandfather's Penny.

Howliston, Cat Tails and Other Tales.
Kingsley, Water Babies.
Stevenson, Raindrops.
Cook, Nature Myths.
Elson Primer, Icicle Poem.

Teacher's References:

O'Shea and Kellog, Health Habits.
Ritchie, Hygiene and Sanitation Primers.
Cummings, Nature Study for Primary Grades.
Comstock, Handbook of Nature Study.
Barber, Science for Beginners.
Hodgdon, General Science for the Grades.
Weather Bureau (U. S.), Cloud Charts.
Longstreth, Reading the Weather.
Hunter and Whitman, Civic Science in the Home.
Buckley, Fairyland of Science.

TOPIC 4—KEEPING WARM. X. Y. Z.

Activities

Let this take the form of a free expression on the part of the children to carry on a project.

Possibilities:

1. The winter house and the materials out of which it is built.
2. Heating the home or sources of heat.
3. Woolen clothing and a study of sheep.

TOPIC 5—DOGS AND THEIR WILD RELATIVES. X. Y. Z.

Activities

A similar type of activities given for the cat, Grade I, Topic 3, may be followed for the dog lessons.

A. Two or more kinds of dogs may be brought to school, fed and allowed to nap, that the children may make specific observations.

Problems

1. How many kinds of dogs do we know?
2. Uses of a dog: (a) to grown-up people; (b) to children.
3. Structure and habits. Feeding, drinking, sleep position, cleanliness, senses.

B. Let the children bring pictures or cut out forms of their favorite dogs.

C. Wild relatives. From pictures and recalling animals seen at the Zoo, let the children write names of the wild forms and tell in what ways they resemble the dog.

Collect pictures and work on an animal scrap book for the room.

Literature for Children:

St. Nicholas, Stories of Brave Dogs.
Thompson-Seton, Lives of the Hunted, Wild Animals I Have Known.
Kipling, Jungle Stories.

Teacher's References:

Visual Education Stereographs, Children's Museum.
Thompson-Seton, Animals I Have Known.
National Geographic Magazine, 1916 and 1919.
Hodge, Nature Study and Life.
McMurry, Nature Study Lesson.
Downing, Field and Laboratory Guide in Biology, Nature Study, pp. 56-66.

TOPIC 6—WINTER BIRDS. X. Y. Z.

(Nuthatch, English Sparrow, Pigeon.)

Activities

Problem 1. Do winter birds seem to prefer to live in the city or the woods?

After studying the nuthatch from pictures and museum specimen, the children can make careful search to discover it is to be found with the sparrows or pigeons. Might it be found at Belle Isle or Palmer Park?

Problem 2. How can we encourage the pigeons to assemble about the school grounds?

Make a project of feeding the pigeons.

To stimulate the gathering of facts concerning the pigeon and its habits from actual observation, reserve blackboard space made attractive by special decorations for such record. Credit may be given by placing the initials of each child after the statement of the observation made by him.

See references after Grade 1, Topic 4.

TOPIC 7—SKY STUDY. X.

The sun and its family; the planets.

Zodiac constellations, Taurus, the Bull; Pleiades; Gemini, the twins, with Castor and Polluz its brightest stars.

Orion, seen in the south early in January.

Activities

Scatter this study throughout the month using stories, charts, or board drawings, games in which the children form groups to represent star clusters, and other devices.

Literature for Children:

Elson Reader II., What Lights the Stars?
Gordon Reader III., The Sun's Travels.
Gordon Reader III., Stars In the Sky.
Horace Mann II., The Moon.

Teacher's References:

Proctor, Giant Sun and His Family.
Gall, Easy Guide to the Constellations.
Warner, Star Stories for Little Folks.
Downing, Field and Laboratory Guide in Physical Nature Study.
Baikie, Peeps at the Heavens.
Cook, Nature Myths.
Rogers, Earth and Sky Every Child Should Know.
Marten, Friendly Stars.
Children's Museum Pictures.

February

Motive: A month of Birthdays.

TOPIC 1—CHERRY BLOSSOMS, FORSYTHIA, AND PUSSY-WILLOWS FOR WASHINGTON'S BIRTHDAY. X. Y. Z.

Activities

1. Bring in a few branches and place stems in warm water to stimulate growth. Allow at least three weeks for opening. Select branches on which beds are most abundant to be sure of flower buds. Change the water frequently.
2. See Grade 1, Topic 1, for House Plants.
3. Let a few children work out a miniature Japanese garden.
4. Plant in earth carrots, turnips, and sweet potatoes.
5. Lentil seeds may be soaked about three days, then placed in a dish and sprinkled each day. The sprouting, seedling, and even later stages can be observed.
6. Refer to Children's Museum for pictures and branches.

TOPIC 2—THE CALENDAR AND BIRTHDAYS. X. Y.

Activities

1. Make a special feature of the calendar this month by drawing a good sized one on the board with space for a name to be inserted under each number. Color the numbers 12 and 22 in red, white and blue. Surround the 12 with green and write the name of Darwin under that of Lincoln. In the other blocks write the names of all of the children whose birthdays occur in February. Birthday verses could be written for Valentine remembrances for the latter group.
2. Devise a method to emphasize the difference in the length of days the first and twenty-eighth of February.

Literature for Children:

Bailey, For the Children's Hour, pp. 255-261.
The World Book, Darwin, Lincoln, Washington.
Children's Museum, Pictures of Darwin and Lincoln.

TOPIC 3—WEATHER AND THE THERMOMETER. X.

Activities

1. Secure two thermometers and hang one on the inside wall of the room and the other on the casing outside of the window, but visible through the glass.

2. Draw two enlarged thermometers on the board to record the indoor and outdoor temperature when the children shall have learned to note the change in the height of the mercury by means of the experiments given below:

a. Breathe on the bulb and note the change in the height of the mercury.

b. Take the temperature of melting ice or snow.

c. Bring in a pan of freezing water and rest the freezing point.

d. Insert the bulb into warm water, take record, then reduce the temperature 20 degrees by adding cold water.

e. Open the window to allow the cold air to strike the thermometer and watch the descent of the mercury.

f. Learn to judge the temperature of the room, then verify.

g. Let committees make consecutive daily readings of the outdoor temperature and represent graphically the variations above and below the freezing point.

h. It may be possible to include the reading of a clinical thermometer when the school nurse is present in the building.

Literature for Children:

Bryant, A Winter Piece—"But Winter Has Yet Brighter Scenes."
Longfellow, An Afternoon in February—"The Day Is Ending."
Baldwin and Bender, Second Reader, The Months.

Teacher's References:

Cummings, Nature Study, Primary grades, p. 88.
Comstock, Handbook, p. 865.
Barber, Science for Beginners, p. 12.
Fabre, J. H., The Story Book of Science, The Thermometer.
Trafton, Science of Home and Community, Chapter XXXI.
Children's Museum Pictures, Thermometers.

TOPIC 4—STAR STUDY. X.

Activities

See Grade 1.

Draw the figures containing the constellations: Orion, Canis, major and minor; Pegassus; and any others previously studied.

Literature for Children:

Warner, Star Stories for Little Folks.

Johnson, Gaylord, The Star People.
Story of Orion and Other Constellations.

Teacher's References:

Gall, Easy Guide to the Constellations.
Moseley, Trees, Stars and Birds, Chapters 7 and 8.
Children's Museum, Pictures of Constellations and Heavens for February.

TOPIC 5—SOURCES OF LIGHT AND HEAT. X. Y.

Activities

Natural

1. The Sun. Review facts concerning its color, shape appearance and movements.

Its work.

a. Giving heat. Enumerate proofs gathered from summer and winter observations and experiences.

b. Giving light.

Consider the importance of sunlight by recounting things that happen under its influence.

Its colors when broken up to form the rainbow.

Hang prisms in the windows.

2. The moon. The wonders of a moonlit night.

Illustrate the fact that the moonshine is really reflected sunshine by catching the sunlight in a hand mirror and reflecting it into the faces of the children.

3. The stars.

Compare the cloudy night with the clear starry night.

Consider the fixed stars as far distant suns, many of them larger than our sun.

Artificial Heat Production

1. Ancient methods and Boy Scout devices. Try rubbing two sticks together till they feel warm.
2. Materials used for bonfires and campfires.
3. Open fireplaces and fuels used.
4. Stoves for heating and cooking.
5. Furnace, hot water, and steam heat.

a. Cut out pictures from advertisements in old magazines and commercial catalogs of all sorts of heating and cooking devices. Make charts or booklets.

b. Collect samples of fuels for a permanent collection, including wood, soft and hard coal, briquettes, screenings, and peat. Supplement material brought by the children by museum specimens and pictures of coal mines.

Impress the fact that all forms of heat originated from the sun.

Light Production

1. Candles.
2. Lamps of all types.
3. Gas.
4. Electricity.

Literature for Children:

Holbrook, The Book of Nature Myths.
The Earth and Sky.
Why the Face of the Moon Is White.
Why All Men Love the Moon.

Teacher's References:

Fabre, J. H., The Story Book of Science.
The Sun, Chapter LIV.
Day and Night, Chapter LV.
Fabre, J. H., The Secret of Everyday Things.
Heat Conduction.
Light.
Moseley, Trees, Stars and Birds, Chapters 9-12.
Rocheleau, Geography of Commerce and Industry, Chapter X.
Trafton, Science of Home and Community, Chapter III.
Children's Museum, Coal and Peat and Pictures of Mining Coal Prisms.

TOPIC 6—WOODS. X.

Activities

A. Test the children's interest in building materials by assembling blocks and stimulating the desire to build with some definite purpose. The class may be divided into several groups.

Suggested sources of blocks:

The Kindergarten equipment.

The Manual Training waste pieces of wood sawed into proper forms.

Sample woods from various sources.

Labelled specimens from the Children's Museum.

As work progresses with the blocks it should be noted that they differ in color, texture, and weight. Try to match them with the labelled specimens and learn if they have come from some of the trees previously studied. This will afford an opportunity to review the trees and connect the leaves, winter forms of the trees and the wood derived from them. Use logging scenes in lantern slides and stereographs.

B. A possible project may be the investigation of the various uses of wood in the school room and other parts of the building.

Stimulate a rivalry in preparing the longest list of wood work in the building and the loose articles of wood.

Study buildings in the process of construction and look for the heavy timber in rough construction and finer timber used for interior work.

If a lumber yard is conveniently located a group can be taken to gather information and report to the class. This may suggest the saw mill in transportation of logs, and the forest yielding timber.

Baldwin and Bender Second Reader. The Little Builder.

Teacher's References:

Downing, Source Book of Biological Nature Study, p. 344.
Comstock, Handbook, p. 726-730.
Roth, Book of Forestry.
Gifford, Practical Forestry.
Poulsson, In the Child's World, pp. 28-32.
Children's Museum, Wood Specimens.

TOPIC 7—OTHER BUILDING MATERIALS IN THE SCHOOL AND HOME. X. Y. Z.

Activities

The children may look about the building and list other materials than wood used in its construction. This should include: sandstone, limestone, slate, concrete, bricks, tile, glass, cement, mortar, etc.

Make a collection of samples of the above materials and all available types of stones. Secure from the Children's Museum the labelled collection of rocks and metals and minerals for comparison.

Tests

1. Limestone may be detected by applying a few drops of strong vinegar. This will cause an effervescence. (When limestone is broken and powdered it becomes pure lime or cement, depending on its purity.)

2. Strike two pieces of sandstone together and note the odor of burnt powder, due to the silica. (Pure sand particles are composed of silica. It is also the substance out of which glass is made.)

A block of concrete may be made if a group of children can assemble the constituents in dry form. Provide also a basin, a small wooden box, like a chalk box, water, and a stick for stirring.

Directions:

Mix together—one part cement (one cupful);
one part sand;
two parts small stones (gravel);
one part water.

Fill the wooden box and leave in a warm place to dry and harden. Later remove the box.

Bricks may be made by another group by mixing modelling clay and sand, they may be dried in the sun or over the radiator.

From granite to clay. The teacher may exhibit a piece of granite

and a lump of clay while she tells the history of the transformation. See Howliston—Cat Tails and Other Tales. "Grandma Kaoline."

In the course of the development of this topic the children may be taken to a building in process of construction. Let them suggest other exercises in addition to those here given.

Literature for Children:

Bailey, For the Children's Hour, pp. 39, 42, 96.

Teacher's References:

Children's Museum, Stereographs in Primary Set VII., 107-113.
Fairbanks, Rocks and Minerals.
Rogers, Earth and Sky.
International Encyclopedia.
Cummings, Nature Study Primer, p. 66.
Rocheleau, Geography of Commerce and Industry, Chapter XI.
Pickard, Industrial Work for Boys, Chapter VI.
Children's Museum, Specimens of Building Materials.

TOPIC 8—RATS AND MICE. MORE RODENTS. X. Y. Z.

Activities

Teacher's purpose: To develop interest in a campaign that will gain the cooperation of parents and help to exterminate such animals.

After a brief discussion in which the distinctions between rats and mice have been made clear, let the children divided into two groups for competitive sentence writing. Group 1 may write on rats, group 2 on mice. The papers may then be exchanged and scored by the children. If interest will justify, the one in each group who has the best and largest number of sentences may be made captain in a campaign to report the number of (1) rats and (2) mice seen, heard, or caught, in the homes of their neighborhoods. Each captain can keep his record in a small note book but a board record can show the totals according to streets. Reports from all co-operating schools would make an interesting news item.

The sentences may cover the following and other points:

1. Where I have seen these animals.
2. Where I have heard them.
3. What harm they did.
4. How they were caught.
5. The number our cat has caught in a week.
6. Why our garbage can should be kept tightly covered.

It may be possible to secure a cage of pet white rats to keep in the room for a day or two, that observations may be made concerning their habits.

The children may cut out paper rats and mice while the teacher reads Browning's Child's Story, The Pied Piper of Hamlin.

Literature for Children:

Robert Browning, The Pied Piper of Hamlin.
Bailey, For the Children's Hour, p. 45, p. 75, p. 122, p. 296.
The Art-Literature Readers, Book I., The City Mouse and the Garden Mouse.

Teacher's References:

Comstock, Handbook, p. 224.
Kellogg and Heath, Animal Studies—"Why the Field Mouse Is Little."
Children's Museum, Specimens and pictures.

March

Motive: Spring begins.

TOPIC 1—WINDS AND WEATHER. X.

Activities

Discuss the winds that bring the summer heat and winter cold. Watch the school flag and smoke and note the various directions in which they are blown. To fix the idea of the points of the compass from which winds blow, let each child cut from an old newspaper two similar squares about three inches across and place the letters N, E, S, W, in the four corners. Lay the second square on top with the points half way between those on the lower one. Include on each point of the second the letters found on both sides of it, as NW, NE, SW, SE. Run a pin through the middle and when the eight points have been learned and applied to the room and outside of the building, make a pin wheel out of the squares.

Another means of impressing the same ideas is to build a "Temple of the Winds," after telling the story of the octagonal tower, "the eight sides of which face the eight principal winds." Comstock Handbook, p. 858. Build in modeling clay or folded paper. The official storm signals can be drawn in their proper colors on the sides of the latter. (See Comstock, p. 88.)

The teacher can draw the weather and storm flags as a black board border to serve as models from which the children can make the weather flags on poles according to the following direction:

Weather Flags on poles.

"For standards for poles, use spools, large ones preferably.

Poles may be made from pencils, meat skewers, or slim sticks, or twigs if straight enough.

Place two tacks on the poles, one at the top, the other at the bottom, on the same side, tie a piece of string around the two tacks, rather tight, but so you can pull the string around, and it will go smoothly.

Make flags, according to descriptions in "Handbook of Nature Study," Comstock, under "Weather."

Paste flags on to string, and raise or lower them as you wish.

If you wish to reverse flags, take them off, string and all, and put them back on the pole upside down."

Literature for Children:

Lloyd Adams Noble, The Summers Readers, Second Reader, March.
Child's World, The North Wind at Play.
Stevenson, The Wind.
Revised Aldine Reader, Windy Nights.
The Wind and the Moon.
The Wind in a Frolic.
Elson's Third Reader, Ulysses and the Bags of Winds.
Signs of the Season.

Teacher's References:

Comstock, Handbook, Part IV., Weather.
Rogers, Earth and Sky, pp. 35-49.

TOPIC 2—SKY STUDY. X.

Activities

1. The change in seasons:

Winter gives way to spring, March 21st. The sun sets due west and rises due east. Interest the children in locating streets in their own neighborhoods in which the sun seems to set at the end of the street. Early risers may catch the rising sun in the east in the same way. Place a stick in the school ground that will point to the sun at noon. This may be observed by the children as they enter school in the afternoon.

Repeat the study of the clock-face as given in December. If no other paper is available use newspaper. Make an eight-inch square, and fold this diagonally twice, then into thirds, finally, double. Tear or cut off the points at the broad end. Open and draw lines both between and along the creases (total 24). Draw one diameter heavier than the rest to locate noon and midnight, and write the letters A. M. and P. M. on either side of this line. Number 1—12 at the end of the lines in each half. Impress the equal length of day and night by coloring one-half of the paper clock-face dark to represent night. Consult the daily

weather report in the morning paper for the exact time of sunrise and sunset and run the line of division between night and day through these points on the clock.

2. The evening sky:

Look to the west for the early evening star. Venus is the evening star from March to November.

Spanning the heavens from east to west with Castor and Pollux (the twin stars of Gemini) at the zenith may be found the constellation of the Zodiac. See the North American Almanac star map or the current number of Scientific American (astronomy page) for the form and location of the six visible zodiacal constellations, arranged as follows from west to east:—Aries, the Ram; Taurus, the Bull; Gemini, the Twins; Cancer, the Crab; Leo, the Lion; Virgo, the Virgin.

Look for the four stars of the first magnitude forming a diamond shaped figure; Pollux in Gemini, Betelgeuse in Orion, Procyon in Canis minor (Lesser Dog), and Regulus in Leo.

These star groups may be represented by silver star stickers on a dark background, or by drawing on the board the figures imagined by the ancients.

Literature for Children:

Warner, Star Stories for Little Folks.

Teacher's References:

Gall, Easy Guide to the Constellations.
Johnson, The Star People.
Rogers, Earth and Sky Every Child Should Know.
The American Almanac (Current year.)
The Scientific American (Current month.)
Collins, The Book of Stars.
Cook, Nature Myths.
Moseley, Trees, Stars and Birds.

TOPIC 3—EARLY BIRDS. X. Y. Z.

Meadowlark, Song Sparrow, and Grackle.

Activities

Review the robin and bluebird, studied in the first grade, and introduce the new ones by means of their notes or calls. If victrola and bird records are available, make use of them at this time. Study the birds themselves from museum specimens and supplement the work with pictures.

Bring out color markings, size, bill, feet, food, and nesting habits.

Cut out bird-silhouettes, practising first with newspaper until size and form are as nearly correct as possible, then trace on colored paper, or paper colored with crayons. Mount the best for the room decorations.

Start a bird calendar. Encourage the bringing of bird pictures of all sizes and kinds. These may be used on the wall or for booklets.

Parents may help by making paper-cambric books for bird primers.

Try to develop purposing and self directed activities in this study.

Literature for Children:

"The year's at the spring
And day's at the morn;
Morning's at seven;
The hillside's dew-pearled;
The lark's on the wing;
The snail's on the thorn;
God's in His heaven—
All's right with the world!"

Robert Browning.

Teacher's References:

Blanchan, Birds Every Child Should Know.
Miller, True Bird Stories.
Patch, Bird Stories.

TOPIC 4—FROM ROCKS TO SOILS. X.

Activities

Use the sand table or a large, flat, wooden box. Fill this with assorted samples of rocks and soils, separated into sections by means of strips of cardboard, glass, or thin boards. The samples may include broken rocks, water-worn rocks, pebbles, gravel, coarse and fine sand, yellow loam and blue clay, and even broken shells.

Let the children handle these freely and share in assembling the collection. Recognition games may be played to make certain they can name them from both sight and touch.

Write the list on the board and test their former experience with rocks and soils by allowing the children to write in a given time, under the title "Where I have seen"—statements as possible. Sample, "Sand by the lake," "Clay in our yard," etc.

The teacher can tell two stories of the origin of soil—

1. The rock that remained at home and covered itself with soil and vegetation.
2. The rock that traveled and passed through varied experiences.

As clay came from the disintegration of feldspar in granite, so sand has come from the quartz in granite.

Problems

1. Why is sand better than clay in "sand" tables?
2. Which soil makes the best mud-pies? Make pies and allow them to dry for 24 to 48 hours.

3. Is sand alone, clay alone, or a mixture of sand and clay, best for growing plants?

Experiments

(a) Do they catch the same amount of water? Select three similar wide-mouthed bottles (pickle bottles), and tie over each a piece of cheese cloth to hang loosely like a bag into the neck of the bottle. Measure equal amount of sand, clay, and a mixture of the two. Place the sand in bag bottle A, clay in bottle B, and the mixture in bottle C.

Let three children pour simultaneously an equal quantity of water (1-4 of a glass) through the soil in each bottle.

Questions

Which begins to drip first?
Through which does the most water pass?
Which holds most water?

(b) Which soil is the best for seed-germinating? Seedlings? Plant an equal number of wheat or corn seeds in each of the soils and give similar conditions of temperature, water and light. Watch development.

(c) Why are some soils very dark, or black?

Fill a bottle 1-3 full of black loam and add water till it fills 2-3 of the bottle. Shake well, then allow to settle. The light particles that float on the top are bits of humus. If pure humus (as decaying leaves) is available, combine it with the sand and clay mixture. Plant seeds in this and add to the series in experiment b.

Teacher's References:

Comstock, Handbook, p. 833; pp. 842-849.
Rogers, Earth and Sky, pp. 27-30; 72-77.
Gray, Nature's Miracles.

TOPIC 5—FROGS AND TOADS. X. Y. Z.

Activities

A. Follow directions given in Topic 4, Grade 1. Toads' eggs may also be found in the pools with the frogs' eggs. These are laid in strings and are thus easily distinguished from the frogs' eggs. The gelatinous covering seems to protect the eggs from being eaten by birds and fish. The black and white colors render them less visible from both the upper and lower sides. Watch for the following states:

1. The football form.

2. Elongated and enlarged at one end for the head.

3. Freed from the jelly and attached to twigs or stone by means of sucking-disks.

4. The first swimming stage when its mouth has developed.

5. The gills through which breathing occurs are seen as fringe on either side of the head at first, then later disappear and become absorbed, though the tadpole is still a water-breather.

6. Appearance of hind legs and then the fore legs.

7. Absorption of the tail and development into an adult frog that feeds no longer on green plant life but on insects. (For this reason the young frogs should be returned to pools to continue their further growth.)

B. Several kinds of frogs may be brought in by the children. The very largest are bullfrogs. "The spring frog is about three inches in length. The back is green, marked with black spots, and the underside is white. The green frog is also green, but his belly is yellow instead of white and he is marked with black blotches above. The pickeral frog is light brown in color, and is marked above with two rows of dark brown, rather square, blotches, framed with lighter brown. The wood frog is brown, but has a broad, black, band running back from the snout along each side of the head." Downing.

C. Study both the toads and frogs while they are kept in a temporary vivarium, an aquarium, fish bowl, or battery jar, in the bottom of which is moss, sod, or moist earth. Flies, cut-worms, and other insects may serve as food.

D. As children are often inclined to kill the frogs or treat them cruelly, try to develop the humane attitude toward these as well as other useful animals. Does each frog furnish enough meat to justify killing them for food?

E. Let the children find the special characteristics that belong to the frog and toad. How do they protect themselves? How do they differ from fish?

Teacher's References:

Downing, Source Book of Biological Nature Study, pp. 42-49.
Comstock, Handbook, pp. 181-196.
Fabre, Animal Life in Field and Garden, pp. 273-289.
Lucas, A Book of Verses for Children.
Sharp, The Spring of the Year.
Torelle, Plant and Animal Children, The Frog Family.

TOPIC 6—GARDEN ANTICIPATIONS. X. Y. Z.

Activities

A. Seeds:

1. Collections of seeds made by the children last fall can now be used for the study of germination.

2. In case no collections were made, common navy or kidney beans, field corn, garden peas, and wheat or oats, may be used.

3. The following devices may serve as germinators:

(a) The glass petri dishes with moist blotting paper in the bottom. Use the petri dishes in pairs, like the pill box and its cover.

(b) A tumbler or jelly-glass germinator:—"Cut two or three strips of blotting paper and one of black calico nearly as wide as the tumbler is deep and long enough to go round the tumbler. Moisten them and put them in the tumbler, the cloth strip next to the glass and the two or three thickness of blotting paper all around inside the glass. Insert two of the seeds named —above between the glass and the cloth two inches below the top of the tumbler. Keep some water in the bottom of the tumbler. Cover the tumbler with a piece of cardboard or tin while the seeds are germinating."—Downing.

C. Glass plate germinator:—Between two 4 by 5-inch pieces of glass (photographer's plates are good), place a layer of absorbent cotton covered on both sides with black gauze. From a common cork cut flat sections 1-8 inch thick and place at the corners of the glass. Proceed as follows:—Lay seeds one inch apart in a row on one glass about two inches from the top edge. Place cotton and gauze over the seeds and add another row of seeds on the gauze not to coincide with the first row. Cover with the second glass and fasten all together with four rubber bands. Stand one end in a dish of shallow water.

D. Honey-box and sawdust:—"Fill a glass-front honey box with sawdust. (Can be secured at a meat market.) Moisten the sawdust and plant the seeds against the glass for observation. Moisten the sawdust daily."

E. Tumbler and cheese cloth:—"Tie cheese cloth over the top of a tumbler and fill with water. Seeds placed on the cloth will send their roots through the gauze."—Wilson.

B. Seed Structure:—The teacher may germinate enough beans to permit each child to open and discover the embryo (baby-plant) inside of the coat. The thick halves are the seed leaves or cotyledons, the tiny

leaves between are the first bud or plumule, and the sprout, or hypocotyl, is the root at the lower end and stem at the attached end.

Teacher's References:

Downing, Science Book of Biological Nature Study, pp. 380-390.
Cook, Applied Economic Botany, Chapter I.

TOPIC 7—THE WINDOW BOX AND TRIAL GARDEN. X. Y.

Activities

After deciding on the best soil for seed-planting, secure sufficient amount for a window box and sand table or large flat box. If any of the children desire to plant tomato, cabbage, and pepper seeds for the home garden they may provide cigar boxes for the same.

Sweet alyssum, nasturtium, morning glory, French marigold, and dwarf sweet peas will grow well in the window box.

A model home grounds, including flower and vegetable gardens, can be worked out by the children most interested in the problem.

A typical Michigan farm may interest those children who have spent their summers on a farm.

Children who have lived in sections where peanuts, cotton, or even flax grow, may bring seeds and plant miniature fields of these.

Do not plant small seeds deeper than 1-4 inch, nor larger ones deeper than 1-2 inch. In so far as possible let the children assume responsibility for the care of the plantings.

TOPIC 8—WILLOW WHISTLES. X. Y. Z.

Activities

In making whistles the children may learn the following:

1. Outer green bark.
2. Inner pliable, fibrous bark.
3. Growing ring, full of sap, that loosens in making the whistle.
4. Wood layers, one or more according to age of the branch.
5. Pith in the center.

For directions, see Rosa Lucia—Peter and Polly, Willow Whistles.

April

Motive: Our Spring Opening.

Nature makes preparation. In March she swept the earth with winds. In April she does her washing. Watch her do it.

TOPIC 1—THE APRIL WEATHER BUREAU. X. Y.

Activities

Review the weather signals.

Have a set of weather flags ready for use.

A weather committee may be appointed by the class to watch forecast of weather in the morning paper, and set up the appropriate flags for each day.

A second committee may check the forecast twenty-four hours later by means of two flags, the forecast one and its fulfillment or the reverse. They may result in two like flags if the weather follows the schedule within the twenty-four hour limit. If delayed, the flags will be different.

The entire class may keep a record of the following:

1. Storms

1. Showers.
2. Steady rains.
3. Thunder showers.
4. Hail storms.
5. Snow storms.
6. Wind storms.

Literature for Children:

Wynne, For Days and Days. The Small Clouds Nestled On the Sky.
Howliston, Cat Tails and Other Tales. The Fairy Mercury.

Teacher's References:

Van Buskirk and Smith, The Science of Everyday Life, p. 109.
Barber, Science for Beginners, p. 30.

TOPIC 2—MOON AND STARS. X.

Activities

1. Review the moon phases and stimulate further observations.

Possibilities:

(a) Cut out silhouettes of the four phases.

(b) Make drawings of the same.

(c) Model spheres show markings that appear to us as "the man" or "The lady in the moon." Color with chalk the lighted portion.

(d) Select the four best models, run hat-pins or skewers through them and place on standards. Add larger spheres on standards to represent the sun and earth, and place all bodies in their relative positions.

2. Recall the large and small dippers and Cassiopeia by blackboard drawings or permanent charts and add the two other constellations that "never set"—Cepheus and Draco.

Watch for Venus in the west early in the evening.

Literature for Children:

Cather, Educating by Story-Telling. Story of the Man in the Moon.
Clarke, A Child's Guide to Mythology.

Teacher's References:

Moseley, Trees, Stars and Birds, Part II.
The North American Almanac, 1922.
Elson Reader, Book II., The Star Dipper, p. 14.

TOPIC 3—TREES THAT FURNISH DECORATION FOR THE SPRING OPENING. X. Y. Z.

Activities

By this time the room should be well decorated with developing branches of various kinds of trees brought in during February and March.

These should lead the children, under stimulation, to observe the bursting buds of similar kinds of trees passed between the home and the school. Before the leaves are fully out the teacher should organize each class into groups, with responsible captains, to help conduct the class on field trips to study the trees. The leader may be taken first at the close of school on an investigating trip to find the best trees and the special features for observation.

In general the best city trees for study are the elm, maple, horse chestnut and poplar, though some neighborhoods may have the oak, sycamore and basswood.

The indoor study of branches may include the following:

1. The bud-scales; their opening and falling away, leaving a line or ring of scars at the base of the new part.

2. The bud contents; flowers alone, leaves on a short branch, or a

mixture of leaves and flowers, i e., flower-buds, leaf-buds, or mixed-buds.

3. Which buds open first, the flower or leaf buds?

4. Watch for the development of the elm and maple fruits soon after the flowers fade. Gather these from the ground as soon as they begin to fall.

5. Select a tree near the school building, if possible, to time its period of change from bare to leafy branches.

Improve opportunities presented by special interest to recall the uses of these trees to man, as maple sugar, building, materials, etc.

Interest the children in recognition of trees, both with and without foliage. Make a collection of pictures, or drawings of trees without their foliage and also the leaves from the same kinds. Play a game of placing each leaf on the correct tree.

6. Watch the gymnastic exercises performed by the leaves of the horse chestnut from their earliest fuzzy stage till they are fully expanded.

Literature for Children:

Hopling, Sandman, His Farm Stories, p. 96.

Teacher's References:

Moseley, Trees, Stars and Birds, Part I.
Otis, Michigan Trees.
Downing, Source Book of Biological Nature Study, p. 313.
Rogers, Trees Every Child Should Know.
Rogers, The Tree Book.
Blakeslee and Jarvis, Trees in Their Winter Condition.
Stone and Fickett, Trees in Prose and Poetry.
Pythian, J. E., Trees in Nature, Myth and Art.

TOPIC 4—A. BULBOUS PLANTS. B. WILD FLOWERS. X. Y. Z.

Activities

1. Make a list of all bulbous plants that bloom in April. Recall their planting in the fall, the ones forced to bloom indoors, and the ones that defied the winter cold in their early appearance above ground.

Make a careful study of the tulip flower as a typical member of the lily family and compare all others with it. They are either in the family or closely related to it.

Emphasize the fact that many people grow tulips for all flower lovers to enjoy as they pass the gardens and they invite the cooperation of all children in the protection of these flowers. Drive home the lesson of property rights.

2. Start a flower calendar of wild flowers.

Organize the groups in a simple way for the preservation of wild flowers. They are fast disappearing in this vicinity due to those who

are thoughtless for their future. Never pick all the leaves and flowers from a plant. The leaves prepare for next year's bloom, and at least two or three leaves should be left to work.

Possible April flowers: Adders tongue, bloodroot, squirrel, corn, Dutchman's breeches, cress, spring beauty, early violets.

3. If unable to obtain a few wild flowers, look for chickweed and dandelions in vacant lots.

4. A wood-fern may be planted in the window-box before it has unfolded, to compare its development with that of the house fern.

Literature for Children:

Lovejoy, Nature in Verse, The First Snowdrop.
Lovejoy, Nature in Verse, April Fools.
Lovejoy, Nature in Verse, A Spring Song.
In the Green Wood—"How We Came to Have Yellow Violets," p. 132.

Teacher's References:

Comstock, Handbook of Nature Study, pp. 499, 603 and 684.
Parsons, How to Know the Ferns.
Parsons, How to Know the Wild Flowers.
Gray, New Manual of Botany.
Bonner, Name This Flower.
Blanchan, Nature's Garden.

TOPIC 5—THE FLOWERS INVITE THE BUTTERFLIES AND BUMBLE BEES. X. Y. Z.

Activities

While the children are watching with interest the emergence of moth from their cocoons, they should be on the alert for the first butterflies of the season.

The teacher may read or tell the stories of "Poly, the Easter Butterfly," or "Van, the Easter Butterfly," in "A Little Gateway to Science." Some of the chrysalis cases may be found suspended by their silken threads around buildings and fences.

Butterfly booklets may be started by individuals to contain drawings, dates, and observational notes that will include the life history of these insects and carry the interest through the summer vacation.

Where has the bumble bee spent the winter? How is she awakened in time to attend the spring opening? See "Old Bumble" in "A Little Gateway to Science."

Live butterflies may be kept for a few days, fed on sugar-syrup, honey, or pieces of apple, then liberated.

Silkworm Project

As soon as mulberry trees are in foliage the eggs of the silk worm can be secured, and the larvae carried through the spinning stage.

Literature for Children:
Patch, Edith M., A Little Gateway to Science.
Out Wonder Book, Volume III.

TOPIC 6—FROGS AND TADPOLES. X. Y. Z.

Activities.

The study of frogs and their eggs begun during March will doubtless continue for some time. See March topic.

Literature for Children:
Story Hour Readers, Book 2, Frogs at School.
Gordon Reader III., The Tree Frog.

Teacher's References:
Dickerson, The Frog Book.
Our Wonder World, Book III.

TOPIC 7—THE BROWN THRASHER'S AND CATBIRD'S NOTES ARE HEARD. X. Y. Z.

Activities

Try to keep bird pictures grouped in the room according to the months during which they arrive. This may serve as an incentive for the children to make bird books of their own.

These two birds, belonging to the same family, are among our best songsters. The distinctive rusty brown back of the thrasher and the slaty gray of the catbird, as well as their slender bodies and long tails, are features by which they may readily be recognized.

From the museum specimens let the children make close comparison until each child can identify either bird from another child's description.

Though these birds do not seek bird houses for their nests, they nevertheless, remind us to prepare for the coming of their tiny relative, the house wren, by setting up wren houses. These may be built according to models in the Manual Training department, or crude ones may be made from chalk boxes, tin cans and plant crocks. The hole for the bird entrance should be about the size of a silver quarter.

Literature for Children:
In the Green Wood—"How the Catbird Got Its Song."

Teacher's References:
Moseley, Trees, Stars and Birds.
Reed, Handbook of Land Birds.
Barrows, Michigan Bird Life.
Chapman, Handbook of Birds.
Chapman, The Travels of Birds.
Burroughs, Wake Robin, The Return of the Birds.
Comstock, Handbook.
Our Wonder World, Volume III., p. 89.

TOPIC 8—THE EARTHWORM, A TINY PLOWMAN. X. Y. Z.

Activities

An opportune time for this study is immediately after a heavy rain when the worms have been driven from the ground and are found in abundance on the walks. In an out-door lesson each child can study a different worm to decide if they have been drowned by the rain or are able to crawl back into their homes.

Notice the head and tails ends and the many sections (segments). Are the latter all alike? In the largest segments are the egg-producing organs. If possible watch the crawling movements. Are any trying to return to the ground?

Make ready a pan or box of soil about three inches deep and let each child place a worm on top of the soil at the end of the class period. The following day the children can see if the worms are still on top, and if not visible, their problem will be to decide what has become of them. The soil may finally be well overturned, the worms again left on the surface of the soil and kept moderately moist to determine if they will again burrow into the ground. After leaving them undisturbed for several days watch for evidence of their coming to the surface at night by the tiny mounds left on top. What are the earthworm's enemies?

"In burrowing the worms take more or less earth into the alimentary canal, where it is mixed with the vegetable food of the worm, and nearly all of it passes out with the castings, found on the surface. These castings are therefore a sort of natural compost. Such soil is fertile not alone because of its composition, but because the movements of the worms keep it stirred up and well aerated."

The above facts can be developed by means of questions and observations and included in short stories which the children may be disposed to write.

Literature for Children:

Craig, Nature Study, Third Grade, The Earthworm.
Schwartz, Grasshopper Green's Garden, The Earthworm.

Teacher's References:

The New International Encyclopedia.
Hodge, Nature Study and Life, p. 424.
Comstock, Handbook, p. 462.

TOPIC 9—PLANS AND PLANTING

Activities

If garden space is available in the school grounds or in a neighboring garden, let the children first plan on paper, then plant a small com-

munity plot and care for it through the school year. Older boys and girls belonging to school garden clubs may be willing to continue the care of the small garden through the summer for its produce.

Teacher's References:

See First Grade.

TOPIC 10—THE SNAIL COMES TO THE SPRING OPENING BRINGING HIS HOUSE WITH HIM. X.

Activities

1. Land snails may be found in the woods under dead logs and stumps or even under dead leaves. They should be kept in a large jar or terrarium with moist sand or earth on the bottom. Lettuce or cabbage leaves will serve as food. Water snails found at the edges of streams and lakes may be thrown into the aquarium.

Possible Project: After finding a few kinds of snails and attempting to identify them from pictures such as are found in the New International Encyclopedia and Downing's Sourcebook, the children may wish to make shell collections for themselves, or for the school.

Leave a dish containing a few snails in a conspicuous place where the children may have free access to observe the snail movements. Let the lessons follow very closely the questions asked by the children. They may wish to bring more snails and work out a regular snailery.

Their problems may include the following:

Does the animal find its house or grow it?

Of what use is the shell to the snail?

Do all shells have the same number of turns. (At first there is but one.)

How does the snail crawl? Note the mucilage-like substance secreted by the single large foot.

How does it see and feel its way? (A pair of eyes on long flexible stalks and a shorter pair of feelers make it very alert.)

How does it eat? Find its mouth.

How does it breathe? Find a hole in the body close to the edge of the shell.

Can the snail close the door of its house? Why is this important for the garden snail?

Do all shells open in the same direction?

Do all snails have shells? (The slug is a shell-less snail.)

Do snails lay eggs? Water snails may lay eggs in the aquarium. This accounts for the tiny snails often discovered there. Notice

that there is a great variation in the forms of both land and water snail-shells.

2. Clams, oysters and other bi-valves.

Though these may be taken up more thoroughly in a latter grade, interest may carry into the brief consideration of the shells and exhibit of specimens of all kinds of shells from both fresh and salt water.

Make use of available museum specimens.

Teacher's References:

Comstock, Handbook, pp. 458-461.
Downing, Source Book, pp. 7-16.
New International Encyclopedia.
Rogers, The Shell Book.
Baker, Shells of Land and Water.

May

Motive: May Chorus and May Flowers.

TOPIC 1—SKY STUDY THROUGH THE SCHOOL-ROOM WINDOW. X.

Changing Clouds. (a) Clearing after a rain. (b) Gathering for a storm.

Activities

Plans for this lesson may be prepared in advance to await the opportune time. It should be given only when the children can make their own observations under guidance of the teacher.

Two new words may first be taught—"horizon," where the sky meets the earth, and "zenith," the part of the sky directly over head. Review the points of the compass by having them point to clouds lying in different directions.

The children may then have a period of quiet with paper and pencil ready to record all observations of sky and clouds.

Observations may include:

Blue sky beyond the clouds, forming a background.
Movement of clouds, covering or uncovering the sky.
Direction of movements of highest and lowest clouds.
Massing of clouds together, or tearing apart.
Colors of clouds in different parts of the sky.

Comparison of clouds with a column of smoke rising from some chimney easily seen from the windows.

After recording their observations, the children may be asked to write one or two good questions about clouds. The teacher can select the best from these and write them on the board for class discussion the following day. If only half the children can see the sky from their seats, let the other half carry on work of another character, and the next day take their places next to the window.

The children may wish to collect from magazines and paper cloud pictures for a cloud chart or book for the room. The school librarian may assist in finding poems and stories about clouds. The U. S. Weather Bureau furnishes cloud charts.

Literature for Children:

Sherman, F. D., Clouds.

TOPIC 2—MAY FLOWERS. WILD FLOWERS. X. Y. Z.

Activities

A problem for all, boys and girls and all flower-lovers:

How can we conserve the wild flowers?

What flowers may we pick?

What flowers should we not pick?

What flowers will bloom yearly in a shady corner in our own gardens?

It is a well known fact that sweet peas and pansies continue their blooming for a much longer period when the flowers are not allowed to go to seed. Notice that in the free picking of such flowers the leaves and stems are left on the plants to continue their work; consequently they are able to form more flowers as long as the season lasts. The May Flower period is short and their blooming is about ended when the leaves of the forest trees shade them from the sun. They then begin preparations for the next spring. Many wild plants consist of an underground bulb or rootstock, a single stem, two or three leaves, and a single flower or at least only very few flowers. In picking the spring beauty, trillium, orchid, Jack-in-the-pulpit, and mandrake, all parts above ground are usually taken and thus affording no opportunity for the renewal of the underground parts for the next year. What will become of the wild flowers?

If all flowers were picked as we pick the violets, taking only the flower-stem and not the plant-stem and its leaves, all would be well.

Let a sample of each of the above kinds be brought by the teacher to let the children apply the rule for picking, and carry home the mes-

sage. This is not only the nature-study teacher's opportunity but her responsibility.

Other possible flowers are: Straw lilies, bellwort, phlox, buttercup, wild geranium, and wild strawberry.

The hardiest ones for the home garden are violets, wild geranium, and phlox, with a few ferns.

Both teacher and pupils may bring newspaper and magazine pictures of wild flowers to cut out and mount on drawing paper for wall charts. Flash cards can be printed with the flower names and used in connection with the charts for reviews. Wild flower post cards are available. Blue prints can be successfully made of flowers.

That the children may be able to associate the flowers with their leaves, divide the children into groups to draw, color and cut out separate leaves and flowers of different kinds to be used in a game of placing together the leaves and flowers that belong on the same plant.

Literature for Children:

Meyer, In the Green Fields, The Church in the Woods (Jack-in-the-Pulpit.)
The Children's Hour, Stories of Nature, Making Friends With the Violets.
Elson Reader, Book II—"How Buttercups Came," p. 168.

Teacher's References:

Comstock, Handbook, pp. 496-530.

TOPIC 3—MAY GARDEN-FLOWERS. X. Y. Z.

Activities

The early perennials in the home garden that may be brought in will doubtless include: The Iris or flag, bleeding heart, lily of the valley, polyanthus primrose, and peonies. There may also be daffodils, narcissus and tulips. Their chief interest to the children is their names, color, and how they grow. Note the special type of leaf belonging to each and whether they come up like the dandelion or on bushy stems. Where will the seeds be formed in each flower?

Pictures in old seed catalogs can be used in the making of flower booklets that will include the flowers of each month. This will lead to an understanding of the principle on which a garden can be planned to yield perpetual bloom from spring till fall. If dates are added the booklet becomes a flower calendar.

Teacher's References:

Comstock, Handbook, pp. 599-629.

TOPIC 4—FLOWERING SHRUBS AND TREES. X. Y.

Activities

The study of nature should not only make the children more observ-

ing but create a home and civic pride and respect for property rights. Specimens not brought from home must be legitimately secured.

All plants that are soft and contain little wood, like the annuals and those in bloom now in the gardens die down to the ground in autumn, but shrubs and trees have hard woody stems and well covered buds.

Problems

Why do shrubs always remain as bushes and trees grow so tall?

Where are shrubs planted in the home grounds? Scattered, or in rows against the house and along the edges of the lot?

Which shrubs do you like best because of their flowers?

Learn the names of six or eight shrubs.

Some of the May-blooming, cultivated shrubs are:

Flowering Currant.	Barberry.
Lilac.	Hawthorne (a tree).
Spiraea.	Syringa.
Honeysuckle.	Weigelia.

Wild shrubs or small trees in the woods:

Spice bush (small yellow flowers).
Shadbush or serviceberry (plum-like flowers).
Flowering dogwood.

Teacher's References:

Comstock, Handbook, p. 803.
Keeler, Native Shrubs.

TOPIC 5—MORE SHADE AND FOREST TREES IN BLOOM. X. Y.

Activities

Trees that flowered in March and April (elm and soft maples) may soon be scattering their fruits. How do they do it? Gather and dry some of the fruits for fruit charts.

Other maples (Norway and ash-leaved), oaks, and hickory, begin their flowering. Watch for them. If possible get a specimen of each to press. Gather also the fully developed leaves for pressing and mounting.

Utilize the trees seen from the school window. Study of tree-form and associate the leaf with the tree to which it belongs.

Teacher's References:

Dixon and Fitch, The Human Side of Trees, Chapters II and IV.
Downing, Source Book, Chapter VII.
Comstock, Handbook, p. 726.
Keeler, Our Native Trees.
Rogers, Trees Every Child Should Know.
Rogers, The Tree Book.

TOPIC 6—MAY BIRDS. CHIPPING SPARROW, HOUSE WREN AND BALTIMORE ORIOLE. REVIEW AMERICAN GOLDFINCH. X. Y. Z.

Activities

The teacher is advised to read Chapters XX and XXI in Hodge's Nature Study and Life. The children should develop the John Burroughs attitude toward birds. A tame bird with its freedom is far better than a caged one.

The chipping sparrow that nests on trees near houses has a peculiar sweet trill. It can be compared with the English sparrow in size, color of crown and breast, trimness of nest, and general desirability.

How can we distinguish readily the song sparrow, English and chipping sparrows? What features have they in common that class them in one family?

The children may be divided into six groups and each group cut out and color a different sparrow, the best of which can be selected and mounted for the board.

The house wren responds to invitations to occupy the most varied types of bird houses. Every school building should have at least one wren house in its vicinity. The children should all have the opportunity to study the wren by watching it daily until school closes.

Features to be noted are: Its dark brown color, small size, erect tail, quick movements, and continuous warble.

The Baltimore oriole attracts our attention when apple blossoms are in bloom. Its orange and black coloring, its sociable and variable note, and its swinging nest make the oriole a welcome guest. Why does the orchard owner like him?

Teacher's References:

Barrows, Michigan Bird Life.
Moseley, Trees, Stars and Birds.
Hodge, Nature Study and Life.
Comstock, Handbook.

TOPIC 7—MORE FROGS JOIN THE SPRING CHORUS. X. Y. Z.

The Bullfrog and his smaller relatives, the Green, Pickerel, and Tree Frogs.

Activities

The purpose in a continuation of lessons on frogs is not only to follow the interesting stages in the life history of the frog but to impress the children that there are many kinds of frogs and each plays an impor-

tant part in maintaining the balance in nature. They share with birds the work of destroying insects and consequently are the farmer's friends. The children should be taught to study their habits as they study bird habits and not to kill them for the morsel of meat their legs can furnish. They are protected by law during certain months.

The Bullfrog. The Bullfrog hibernates under water and awakens only when the temperature of the water is between 57 and 69 degrees Fahrenheit. It, with the green, pickerel, and leopard frogs, is a water frog, but it is the "giant among North American frogs." The bullfrog and green frog remain in the tadpole stage for the first year.

The Tree Toad or Frog. This is called a "rain prophet" because after it leaves the pond in June, it lives on the trees of the woods and orchards or about houses and "gives its resonant trills frequently when the air is moist, and is silent during dry spells."

It is suggested that frogs be brought in for the terrarium for a week or two, studied, and returned to their free life. Others can be brought in and the children may thus be able to study different kinds.

If the regulation terrarium is not available for the school, they may be kept in a moss-lined quart jar with screening or mosquito netting tied over the top.

Literature for Children:

Sharp, D. L., The Spring of the Year.
Young Folks Library, A Book of Natural History.
Bartlett, Lillian L., Animals at Home. The Toad.

TOPIC 8—SNAKES AND THEIR TURTLE RELATIVES. X. Y. Z.

Activities

The study of snakes may be of a similar character to that of the first grade; but the children can be led to distinguish further details, such as the plates on the head that are set together like a mosaic. If a picture of the rattlesnake is available, it may be noted that there is a hole or pit between the eye and the nostril, which, besides the rattle on the end of the tail, distinguishes the poisonous from the non-poisonous snakes. The movement in crawling can be contrasted with that of the earthworm.

Turtles. Turtles are classed as reptiles, though the head and tail of turtles seem to be the only apparent snake-like features. Parts of the vertebrae have developed into plates that unite to form a box-like protection above, and the breastbone forms the lower shell.

Kinds:

Terrapin or painted pond turtle, with red-mottled border.
Wood turtle, with concentric rings on each plate.

Box turtle, with a high shell and front and back trap-door.

Soft-shelled or leather-back turtle.

The snapping turtle.

The mud-turtle that feeds under water and only leaves water to lay its eggs.

One turtle may serve for a lesson but two different kinds will afford the opportunity of comparison, though they should not be kept in the same aquarium.

During the lesson the animal may be placed in a conspicuous place on a piece of sod a foot square or a tray of soil and allowed to walk about freely while the children make observations and ask questions.

Literature for Children:

Sharp, D. L., The Spring of the Year.

Teacher's References:

Ditmars, Reptile Book.
Hodge, Nature Study and Life.
International Encyclopedia.
Comstock, Handbook.
Downing, Source Book.
Herpitology of Michigan, Michigan Geological and Biological Survey, Lansing, Michigan.
Paper on Poisonous Snakes. Kellogg. U. S. Biological Survey, Washington, D. C.

June

Motive: *"The lovely and the wild mingled in harmony on Nature's face."*

TOPIC 1—JUNE WEATHER. JUNE SKIES BY NIGHT AND BY DAY. X. Y.

Activities

Find the meaning of "summer temperature" by means of thermometer readings and newspaper weather reports. Determine the week of highest June temperature. Why does summer begin June 21st?

Notice the position of the sun when at its highest, also where it rises and sets. Look at the sun through pieces of smoked glass.

Spend a period out of doors studying shadows cast by objects and children. Let twenty-four children join hands in a circle and number from 1 to 12 in each half. One child standing in the middle will cast a shadow toward one of the children. The time of day may be expressed by the number of the child. This will explain the principle on which the sun dial works.

A sun dial game can be worked out on this basis.

Evening Sky. X.

Mars, a planet near the earth, appears in the west as a red star.

The Milky Way. A band of light across the heavens, most clear in the dark of the moon, is composed of millions of stars much farther away than any bright stars.

The children should be directed to locate Mars and the Milky Way and watch for them during the summer when the latter is the brightest.

Teacher's References:

The American Almanac, 1922.
Collins, The Book of Stars.
Moseley, Trees, Stars and Birds, pp. 180 and 241.

TOPIC 2—JUNE COLORS IN SKY, CLOUDS, TREES AND FLOWERS. X. Y. Z.

Activities

Color project: Using the color scheme taught in the art course, let the children bring flowers and branches of leaves that illustrate as many colors as possible. Stimulate observations of sky colorings as well as colors of soil and vegetation. Match each color with its corresponding color in the color scheme and learn to call each by its proper name.

Purpose: To learn that nature supplied us with all colors and teaches us lessons in color combination.

Suggestion for flower booklet: A page can be devoted to flower colors by outlining disks around a cent or button and filling each with a color produced by water color or crayons that represents a flower color. This could be the final page and include the colors of all flowers studied during the season.

TOPIC 3—TREES SEEN AND STUDIED DURING THE SEASON. (REVIEW.) X. Y. Z.

The Linden or Basswood.

Activities

Use all sorts of devices for the purpose of reviewing the various trees studied. Use pictures, drawings, specimens, and games of recognition.

The Linden Problems

To compare the linden with the catalpa in trunk features, leaf form and edge, and bark.

To find the flowers and decide why they are attached to a special leaf. If the flowers are not in bloom the buds can be easily found and their time of opening noted.

To press a few leaves and flowers.

To watch for the developing fruits.

Teacher's References:

Mathews, Familiar Trees and Their Leaves.
Moseley, Trees, Stars and Birds.
Rogers, The Tree Book.
Otis, Michigan Trees.

TOPIC 4—BIRDS AND THEIR FAMILIES. X. Y. Z.

The Nighthawk and Bob-o-Link.

Activities

Conduct some sort of a review of all birds studied during the season by any approved means, games or dramatization.

A congress of male birds can be held in which each child represents a bird who comes to tell of his mate and their family.

The Nighthawk. All children should be able to hear the night-hawk that lives in the city on the tops of high buildings and skims through the air calling "peent." It makes a booming sound as it swoops down near the ground. Instead of being a hawk, it is really an insect feeder and man's helper, a relative of the Whippoorwill.

The Bob-o-link of the blackbird family is one of the most cheerful birds that summers in this vicinity. The white and yellow markings on the back distinguish it from the other blackbirds, though August finds both male and female in striped buff and black plumage ready for migration. These birds are usually found in open fields.

Teacher's References:

Dugmore, A. R., Bird Homes.
Job, H. K., How to Study Birds. Poulsson, In the Child's World, p. 306.
Herrick, Home Life of Wild Birds.
Matthews, Field Book of Wild Birds and Their Music.
Walker, Our Birds and Their Nestlings.

TOPIC 5—CLOVER AND GRASS IN BLOOM. X. Y.

Activities

Clover—Problems:

1. Learn to recognize a complete clover plant.
2. Learn to distinguish as many different kinds of clover as can be found in the neighborhood.
3. Learn how some clovers spread over the ground.

4. Learn the various uses of clover to man and animals.
5. Learn the relation of bumble-bees and clover.
6. Learn the variation in the number of clover leaflets by hunting for four-leaved clover. Press.

Grass—Problems:

1. To learn to recognize a complete grass plant.
2. To learn why some kinds of grass are very bad weeds.
3. To compare the leaves of different grass plants with one another and with the leaves of corn seedlings.
4. To learn which grasses make the best lawns.
5. To learn why clover and grass are planted together in lawns.
6. To search in vacant lots and uncut lawns for grass in blossom.
7. To make decorative bouquets of grass and clover blossoms.
8. To find grasses when they are shedding their abundance of pollen and learn how the pollen is carried to other grass flowers.
9. To learn to recognize and call by name the grass used as hay. (Timothy.)

Suggestions: The children may be interested in transplanting both clover and grass plants into strawberry boxes to bring to the room for study.

While making this study, the children may happen to locate the weed, Shepherd's Purse. If so, include it, and call attention to the purse like fruits, tiny flowers, and the rosette of leaves growing close to the ground.

Garden Activities

Thinning of young plants to give space for better development.

Weeding. Learn to recognize the young stages of weeds growing between the plant rows.

Cultivating. Does hoeing give the plants air and moisture? Weeds to look for—grass with underground horizontal stems, dock, burdock, thistle, purslane, pigweeds.

June blooming—Perennials, Columbine, Forget-me-not, Pinks, Sweet Williams, Rocket, Coreopsis, June Lily, Orchids.

Literature for Children:

Reed, Nature Studies in Field and Wood.

1. Pond and Swamp Life, p. 48.
2. Water Studies, p. 71.

Teacher's References:

Francis, The Book of Grasses.
Gibson Eye Spy, Luck in Clovers, p. 213.
Book of Knowledge, Vol. VI., The Grass of the Field, p. 1331.

TOPIC 6—WATER LIFE. X.

Activities

Purpose: To discover many kinds of plants and animals living in water.

Quart jars, fish bowls, as well as aquaria may be used as containers of water brought from streams, ponds, and quiet pools with their unknown quantity and kinds of living forms. Eggs and larvae of animals may be caught in a wire strainer. Lift the surface-swimming animals, disturb the plants and stones at the bottom, and strike the strainer against the plants growing at the edge of bank. By this process any of the following animals may be caught:

Water Striders.	The young of Dragon-flies and May-flies.
Whirligig Beetles.	Mosquito larvae and pupae.
Diving Beetles.	Water Boatmen.
Fairy Shrimps.	Giant Water Bugs (electric light bug).

The life history of the mosquito:

The eggs are laid by the adult in standing water.

The eggs hatch into larvae, known as "wigglers."

The larvae develop in a short time into pupae with club-shaped heads.

These are still able to swim with the wriggling motion.

The adult male and female. Only the female sings and bites.

Experiment. To illustrate the possibility of extermination: In a can of water with only mosquito larvae cover the surface of the water with a thin layer of any kind of oil. Watch for results.

Discussion and application. How could a neighborhood combine efforts toward limiting the number of mosquitoes?

Literature for Children:

Faber, Insect Stories, The Dragon of Laguinta, p. 125.
Meyer, Joe, Orchard and Meadow. A True Fairy Tale, p. 92.
Eclectic Readers, Living Creatures, A Musical Burglar, p. 83.

Teacher's References:

Comstock, J. H., Insect Life, Chapter IV.
Downing, Source Book of Biological Nature Study, Chapter I.
Ward and Whipple, Fresh Water Biology.
Weed, Life Histories of American Insects, A Family of Water Kings.
Bamford, Up and Down the Brooks

TOPIC 7—ANIMALS AT THE "ZOO." X. Y. Z.

Activities

The teacher should encourage the children to influence their parents to take them to see the animals at Belle Isle. This should give an extra incentive to work out an animal project, and play animal games in which each will impersonate the animal in which he is most interested and has learned most about from books and the animals themselves.

Field day may suggest opportunities for visiting animal cages at Belle Isle. Committees may be appointed to learn and report about certain definite animals.

Clay modelling and colored drawings as well as animal scrap books are possible activities.

Literature for Children:

Burgess, The Burgess Animal Book for Children.

Teacher's References:

Duncan, Animal Life in the New World.
Duncan, Wonders of Animal Life.
Bostock, The Training of Wild Animals.
Carter, Lion and Tiger Stories.
Knight, Animals of the World for Young People.
Eclectic Readers, Familiar Animals and Their Wild Kindred.
Ingersoll, Ernest, Wild Neighbors.

THE AWAKENING OF SPRING

Planned and arranged by
Clarice A. Nicodem—Science
Alice Major—Literature

Presented in Carstens Auditorium
May, 1922
under the direction of
Pearl Pearce

This little play was presented by forty children representing seven different sections. The songs were taught in the music room. The costumes were designed and made under the direction of different departments, the following contributing services: Science, literature, art, auditorium, domestic science, and Special B girls.

Characters

Spring
Jack Frost
Sun
Dame Nature
Trees: Oak, Apple, Elm, Maple, Willow, Cherry, Poplar
Birds: Robin, Oriole, Wren, Tanager, Canary, Bluebird, Woodpecker, Meadowlark, Bob-o-link.
Flowers
Raindrops
Boy, not in costume

Stage setting

Trees arranged in semi-circle on the stage. Spring sleeps on a high bank. Flowers, grouped, sleep at center of stage. Frost at right side, Sun behind the bank. Dame Nature at side front. Raindrops and birds outside ready to enter at proper time. Boy behind curtain, ready to step forward.

Frost (*moves about among trees, looks at Spring, at flowers*):
Oho! I am Jack Frost, still king of the land.
I came down last night on a star-beam;
I will spear these victims, so sparkling and bright,
(*Catches sight of sun slowly rising*)
Oh, here comes the sun!
Now I shall be out of sight,
So through the valley and over the height
In silence I'll take my way.
(*Goes off stage*)

Sun (*coming forth*):
Here I come the smiling sun,
To gaze upon my friends again.
Aha! sweet, drooping flowers,
Come, come, lift up your little heads;
And, trees, put forth your buds and blossoms.
Come back little birds and make our hearts
Gay with your songs of gladness.
Awake! Awake! Spring will soon be here!
For two long weeks I've tried to send down
My rays so warm and bright;
I've found each tiny leaf and stem
And brought it heat and light.

Dame Nature:
Tiny plants and trees of green,
Your seeds I placed with care,
I loosed the soil about your roots,
No effort did I spare.
Come, come, Spring! Awake! Awake!

Spring (*wakens, rises slowly*):
I am coming, Mother Nature,
With the pleasant sunshine laden,
With the honey for the bee
With the blossom for the tree
With the flower and with the leaf;
Till I come, the time is brief,
I come, I come!
(*Moves about, touches trees*)

Trees (*Song—Tune of Bo-Peep*):
We are the trees;
In Spring's sweet breeze
Our buds are softly swelling;
We nod and sway,
This glad, bright day,
Longing for what we're telling.

Longing for Spring
For birds to sing,
To flit and fly and chatter;
For flowers to bloom,
For Spring's perfume,
Longing for what we're telling.

All brown and bare
In winter air,
We've waited such a long time;
Oh, come, dear Spring,
Sweet flowers bring,
And birds, and bees, and song-time.

Spring:
And now that I am here, dear trees, tell me what you want.

Trees (*rustling*):
The birds! The birds!

Spring.
Oak tree, which bird loves you best?

Oak:
The robin!

Robin (*calls outside then comes in*):
I had a beautiful nest in the oak tree last year. I'm going to build another.
(*begins*)

Spring:

Pretty apple tree, with blossoms pink and white, which bird will come to you?

Apple Tree:

The cheerful oriole. (*oriole comes in*)

Spring.

Elm, which is your favorite?

Elm:

I like the tiny, busy wrens. (*wren enters*)

Maple (*speaks up quickly, others follow as birds come in*):

I am the maple, I want the tanager.

Willow:

I am the willow, I want the canary.

Cherry:

I am the cherry, I want the bluebird.

Poplar.

I am the poplar, I listen for the tapping, tapping of the woodpecker.

Meadowlark (*calling, comes in*):

I shall build my nest in the tall grass.

Bob-o-link (*flies in and says*):

I'm dear little Robert of Lincoln,
My heart is so light and so gay
I sing as fast as ever I can
In the meadow lands, all day;
I love the tall-like grasses,
And the daisies—the dear little things.
They pay the best of attention,
And all the birdies sing:
'Bob-o-link! Bob-o-link!
I'm glad, Bob-o-link!'
The book says I'm pretty.
Now, what do you think?

Trees (*Welcome to the birds*):

Welcome, little wanderers!
We're so glad you've come
We've been longing for you.
Welcome to your home.
Shelter, love, protection
We will give to you.
Welcome, and please stay here
All the season through.

Birds:

We will! We will!
We love our northern homes.

Spring (*calls attention to robin*):

See, the robin is building his nest.

Poem (*boy, not in costume, recites*):

"How do the robins build their nest," etc.

Bird (*canary*):

Come, let us all sing a spring song.

All sing:

"There's a wee little nest in the old oak tree," etc.

Bird (*bluebird*):

But where are the flowers? They should be blooming. See, they are only in bud.

Spring.

The raindrops will call them.

Raindrops (*enter, and sun disappears. They move about among flowers, gently touching them as they sing*):

"The Shower Song." (2nd and 3rd verses.)

Flowers (*respond with last stanza, which thanks raindrops for service rendered*).

All sing:

"The Raindrop's Prank." *At the beginning of the last stanza, the sun comes out, and the raindrops form a rainbow with sashes.*

Curtain.

